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Report on

MUNICIPAL IMPLEMENTATION OF STORMWATER MANAGEMENT PRACTICES IN ONTARIO

for

the Ontario Ministry of the Environment

Water Resources Branch

by

University of Waterloo

School of Urban and Regional Planning

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Municipal Implementation of Stormwater Management Practices in Ontario

A Report Prepared for the Ontario Ministry of the Environment,

Water Resources Branch, Water and Wastewater Management Section

by

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ACKNOWLEDGEMENTS

The authors wish to thank the Ontario Ministry of the Environment, Water Resources Branch, Water and Wastewater Management Section for the financial support given to this study.

II

EXECUTIVE SUMMARY

1 Objectives

The primary objective of this study was to investigate the factors which must be considered by the Urban Drainage Policy Implementation Committee to successfully promote the adoption of stormwater management (SWM) practices by local municipalities. Following from this objective were three sub-objectives. These are:

1. to determine the degree of existing municipal involvement in SWM,
2. to detail impediments to the fuller adoption of SWM under a voluntary basis, and
3. to determine the assistance municipalities may require to implement SWM.

Data for the study were collected through a survey of Ontario's largest municipalities. Questionnaires were mailed to the Engineering or Works Departments of all local municipalities with a population in 1982 of 10,000 and greater. Seventy-one of the 110 municipalities initially contacted returned the questionnaire for a response rate of 65%.

2 Results

2.1 Status of Municipal Involvement in SWM

Forty-four municipalities (62% of respondents) are currently employing SWM practices to varying degrees. Implementation and the degree of sophistication tend to increase with municipal population size, and also with the municipal rate of population growth. Of the 27 municipalities not using SWM, 21 declared there is a need to adopt SWM practices. Only 5 respondents indicated no need for SWM and 1 respondent did not know if a need exists.

Twenty-five municipalities (35% of respondents) have official policies supporting some SWM practices. Many smaller municipalities (population less than 25,000) do not have policies. A majority of rapidly growing municipalities have adopted official SWM policies.

2.2 Impediments to SWM

The main problem encountered by municipalities in the implementation of SWM was a lack of understanding on the part of developers. Following closely as a major problem was a lack of municipal funds.

The primary impediment to the adoption of SWM among municipalities currently using a traditional approach is a shortage of municipal funds. This problem is particularly acute among smaller municipalities. Also mentioned as impediments were a lack of staff expertise and the absence of a Provincial policy supporting SWM.

2.3 Role of the Province

Municipal support for Provincial promotion of SWM practices is very strong. Forty-seven municipalities support *increased* Provincial involvement and 11 suggested the Province maintain its existing degree of involvement. Only 6 municipalities recommended reduced Provincial involvement and 7 respondents did not know if the Province should promote SWM more actively. Support for a heightened Provincial role is particularly strong among municipalities currently not using SWM. Favoured measures include subsidization of Master Drainage Plans and sponsoring training and education programs. The desire for subsidization reflects the significant problem posed by a shortage of municipal funds. Respondents indicated a strong demand for guidelines on major-minor design and model municipal policies for urban drainage management. A very strong demand also exists for Provincially sponsored training courses on major-minor design and the review of Master Drainage Plans and SWM Plans submitted by consultants.

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Section 1

INTRODUCTION

1.1 Overview

Urban drainage planning and design in Ontario is in a state of transition. Traditionally, the objective of urban drainage was to remove stormwater from the land surface as quickly as possible, and to convey the runoff to a receiving watercourse. This 'servicing' approach is very effective at providing maximum convenience on-site, particularly during frequent but less intense storms. Unfortunately, the drainage network often cannot cope with the volume of runoff generated during severe but less frequent storms. Common results of surcharged storm drainage systems include on-site flooding, property damage, and pollution.

In recognition of the shortcomings associated with the traditional approach to urban storm drainage a new approach has been gaining increasing acceptance throughout North America. Loosely termed 'stormwater management' (SWM), this new approach is based on *preventing* the on-site and downstream drainage problems commonly resulting from urbanization. Though SWM practices can be applied in developed areas, they are far more suitable for developing areas. Through an integration of land use planning, environmental planning, and drainage planning, SWM can be implemented cost-effectively in the initial stages of urban development.

As a requirement of servicing land developments, urban drainage is principally a local muncipality's responsibility. Municipalities, usually through a combination of policies and criteria, set the standards for stormwater drainage planning and

design. Each local municipality has the ability to select the approach to stormwater drainage considered to be most reflective of its needs.

The Provincial Government has recognized the many advantages to be gained by using SWM practices. Through the auspices of the Urban Drainage Policy Implementation Committee (UDPIC), the Government is promoting the implementation of SWM on a voluntary basis, leaving the decision to implement SWM to the individual municipality. The success of this approach is largely based on how well UDPIC can encourage municipalities that have not yet exploited this new approach to urban drainage, to practise SWM.

1.2 Purpose and Objectives of the Study

The study is intended to assist the UDPIC in the development of a promotional strategy by investigating the factors which must be considered to encourage municipal adoption of SWM. Related to this objective, the study has three basic sub-objectives. These are:

1. to determine the degree of existing municipal involvement in SWM,
2. to detail impediments to the fuller adoption of SWM under a voluntary scenario, and
3. to determine the assistance municipalities may require to implement SWM.

The first sub-objective is intended to give an indication of the amount of municipal involvement in SWM. Collected data provides important background information on the proportion of municipalities practising SWM and their degree of involvement. An important consideration related to this sub-objective is the necessity of knowing why these municipalities adopted SWM. Just as it is important to understand how many municipalities are practising SWM, and why they are

doing so, it is necessary to gain an impression of the proportion of municipalities not practising SWM and to identify the factors discouraging its adoption. The third sub-objective is intended to obtain information from municipal engineers and planners on the types of assistance they would like to receive from the Province in order to voluntarily adopt SWM.

1.3 Research Methodology

1.3.1 Survey Sample

Data for the study were collected through a survey of Ontario's major municipalities. Questionnaires were mailed to all local municipalities with a population in 1982 of 10,000 and greater. Using this criteria, 110 local municipalities accounting for 80.9% of Ontario's total population were contacted. Municipalities with a 1982 population of less than 10,000 were not included in the survey. Including these municipalities would have greatly increased the sample size to 689 municipalities while representing only an additional 19.1% of Ontario's total population.

1.3.2 Questionnaire

It was recognized that municipalities fell into two groups: a) those employing SWM practices and b) those using a traditional approach to urban drainage. Separate questionnaires were prepared to address each group. Though the question-

naires are not identical, they share many common questions and have a similar format. Table 1 provides a comparison of questionnaire formats. Examples of both questionnaires are included in Appendix I.

Table 1: Questionnaire Format

Questionnaire A (SWM)	Questionnaire B (Without SWM)
i) perception of drainage problem	i) perception of drainage problem
ii) factors promoting implementation of SWM	ii) need for SWM program
iii) details of SWM program	iii) impediments to SWM
iv) problems in implementing SWM	iv) inducements to voluntarily adopt SWM
v) preferred role of the Province	v) preferred role of the Province
vi) education and training programs	vi) education and training programs
vii) additional comments	vii) additional comments

Both questionnaires were mailed to the Engineering or Works Department of the selected municipality. Respondents completed the appropriate version based on their perception of the municipality's urban drainage program.

1.3.3 Response Rate

The report is based on an analysis of responses obtained from 71 municipalities. Given the initial sample size of 110 municipalities, the response rate to the survey is 65%. Table 2 gives a breakdown of responses according to the population size of the municipality.

Table 2: Response Rate Classified by Population Size

1982 population in thousands	total munici.	responses	response rate (%)
10 - 25	57	33	58
25 - 50	21	11	52
50 - 75	7	5	71
75 - 100	9	9	100
100 - 250	8	6	75
250 plus	8	7	88
total	110	71	aver. 65

The response rate is substantially higher from larger municipalities with a 1982 population of 50,000 and greater. Results of the survey essentially show the status quo for the larger municipalities. For municipalities with a 1982 population of less than 50,000 the response rate is significantly lower and the results only provide an *indication* of the overall picture.

1.4 Report Organization

The report is divided into 4 inter-related sections. Each section analyzes responses to several questions centred on a common theme. The themes of the sections are as follows:

1. status of municipal involvement in SWM
2. details of municipal SWM programs
3. impediments to municipal adoption of SWM
4. preferred role of the Province.

Sections 1 and 4 are based on aggregated data received from all municipalities. Section 2 relates to only those municipalities which have implemented SWM practices. Section 3 pertains to municipalities currently not utilizing SWM practices.

Detailed information not included in the body of the report, but considered to be very relevant to the objectives of the study, is included in Appendices II and III. Appendix II includes a summary of selected data for each respondent. Appendix III lists additional comments provided by respondents.

Section II

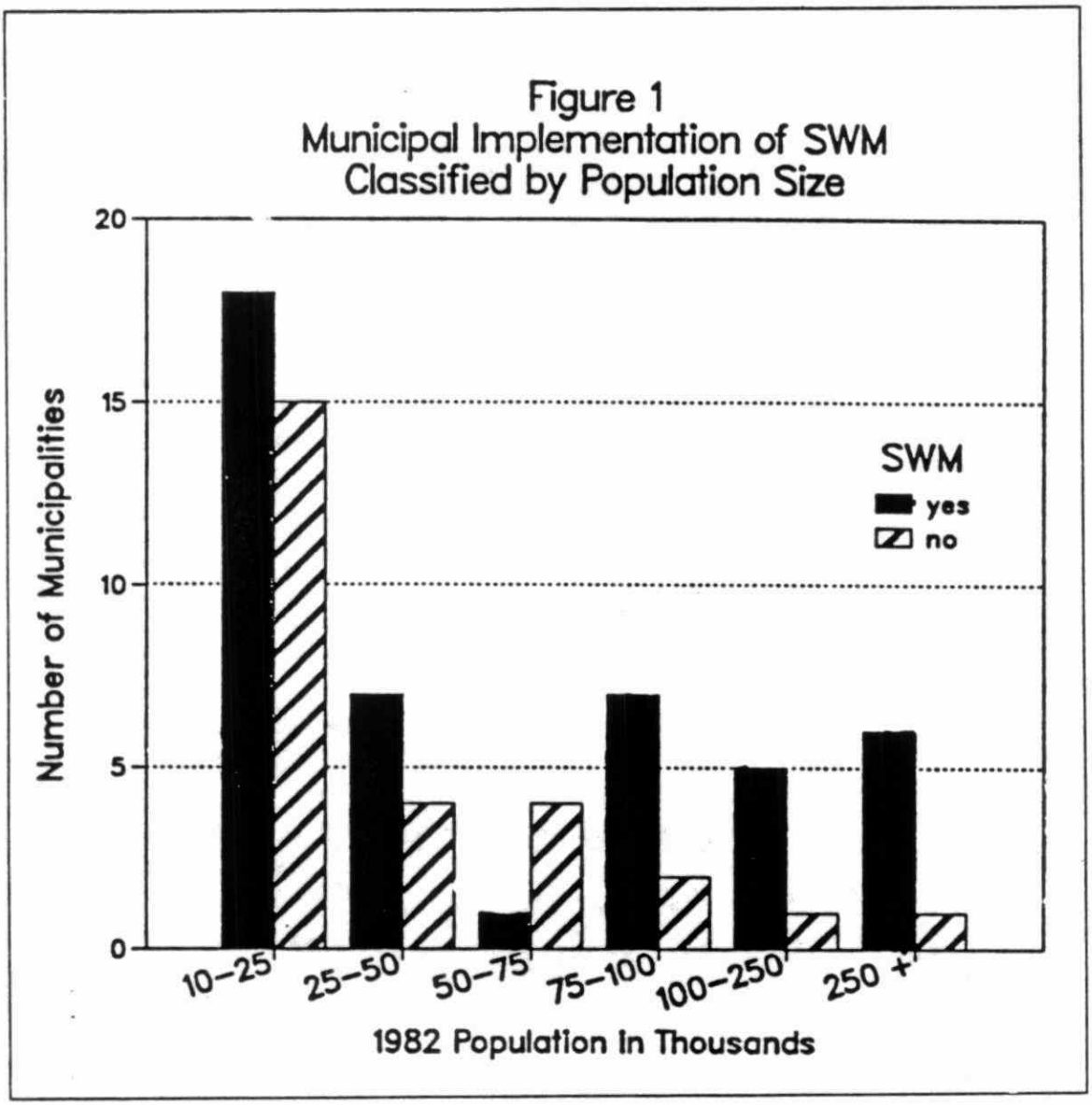
STATUS OF MUNICIPAL INVOLVEMENT IN SWM

2.1 Overview

Results of the survey indicate that 62% of the respondents (44 municipalities) are currently utilizing SWM practices. The remaining 38%, comprised of 27 municipalities, have not implemented SWM. These statistics are more revealing if they are broken down according to the population size of the municipalities and also related to the municipalities' rate of growth. Appendix II details the status of individual municipalities.

2.2 Municipal Implementation of SWM Classified by Size of Population

An examination of Figure 1 indicates that smaller municipalities, particularly those with a population in 1982 ranging between 10000-25000, have not adopted SWM practices as widely as the larger municipalities. With the exception of the population group of 50000-75000, implementation of SWM tends to increase with population size.



2.3 Municipal Implementation of SWM Classified by Population Growth

Since SWM practices are best applied in new land developments, it is necessary to explore the relationship between implementation of SWM and the rate of development within municipalities. Ideally, the rate of development could be represented by the area of land developed over time. Due to the unavailability of such statistics on a uniform basis among all municipalities, the criteria of popula-

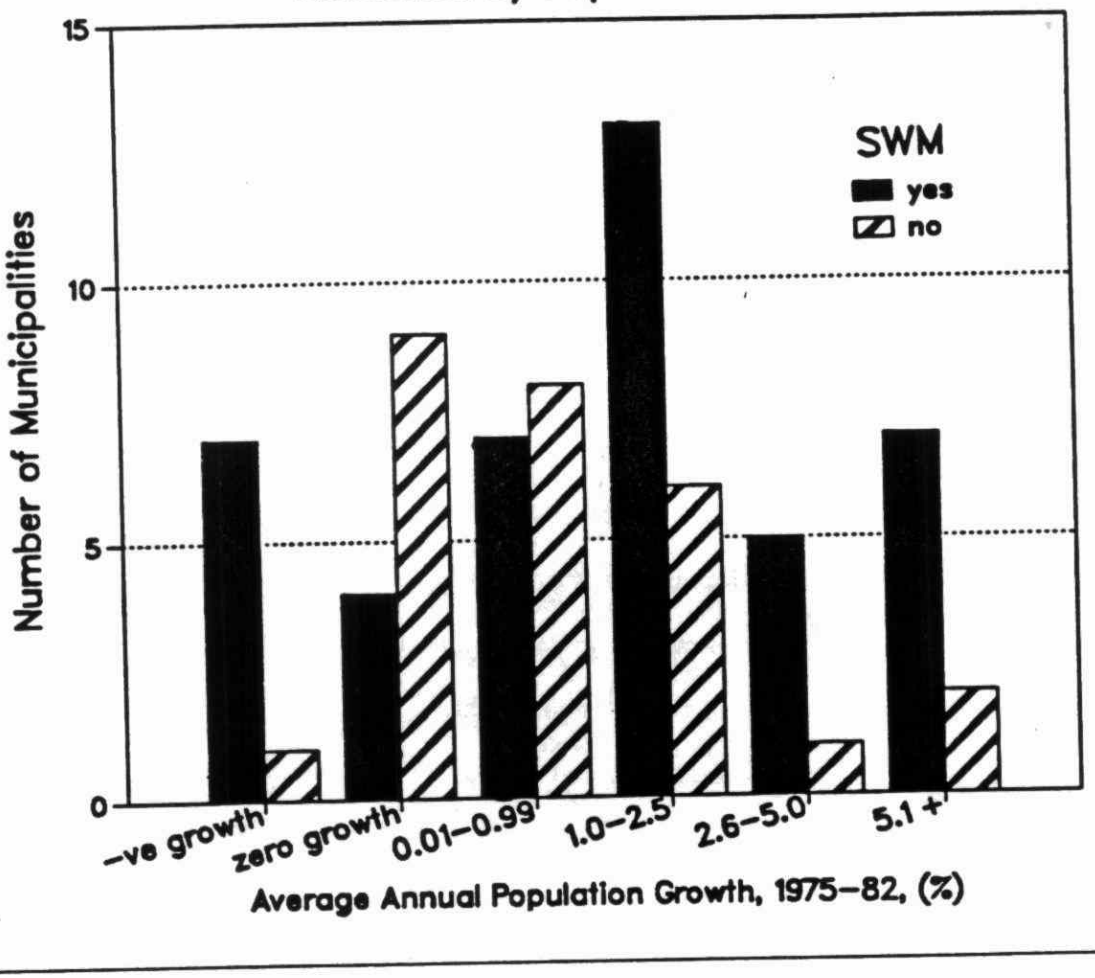
tion growth was selected as an *indicator* of the amount of development occurring within a municipality. For the purposes of this study population growth was calculated as the average annual increase in municipal population during the years 1975 to 1982. This time period is particularly relevant for the SWM philosophy began to gain recognition during the early to mid-1970s and would have been most suitable for adoption by municipalities experiencing rapid growth.

Figure 2 reveals that, in general, municipalities with rapidly increasing populations tend to have adopted SWM. There is a trend towards more widespread utilization of SWM as the rate of population growth increases, excepting the anomaly of municipalities with declining populations.

Examining Figure 2 it can be seen that the implementation of SWM practices rises consistently from a level of 31% among municipalities with no growth to a high of 83% for municipalities with a growth rate of 2.6-5.0%, dropping slightly to 71% for municipalities which grew at a rate faster than 5% per year. This relationship is encouraging for it reveals that SWM has gained acceptance in many of the municipalities where it can be applied cost-effectively in new land developments.

The anomaly to this relationship is associated with municipalities which experienced a loss of population, suggesting little or no new development. It is suggested that these municipalities were applying SWM principles in retrofitting existing drainage networks.

Figure 2
Municipal Implementation of SWM
Classified by Population Growth



Section III

MUNICIPALITIES UTILIZING SWM PRACTICES

3.1 Problems with Stormwater Drainage

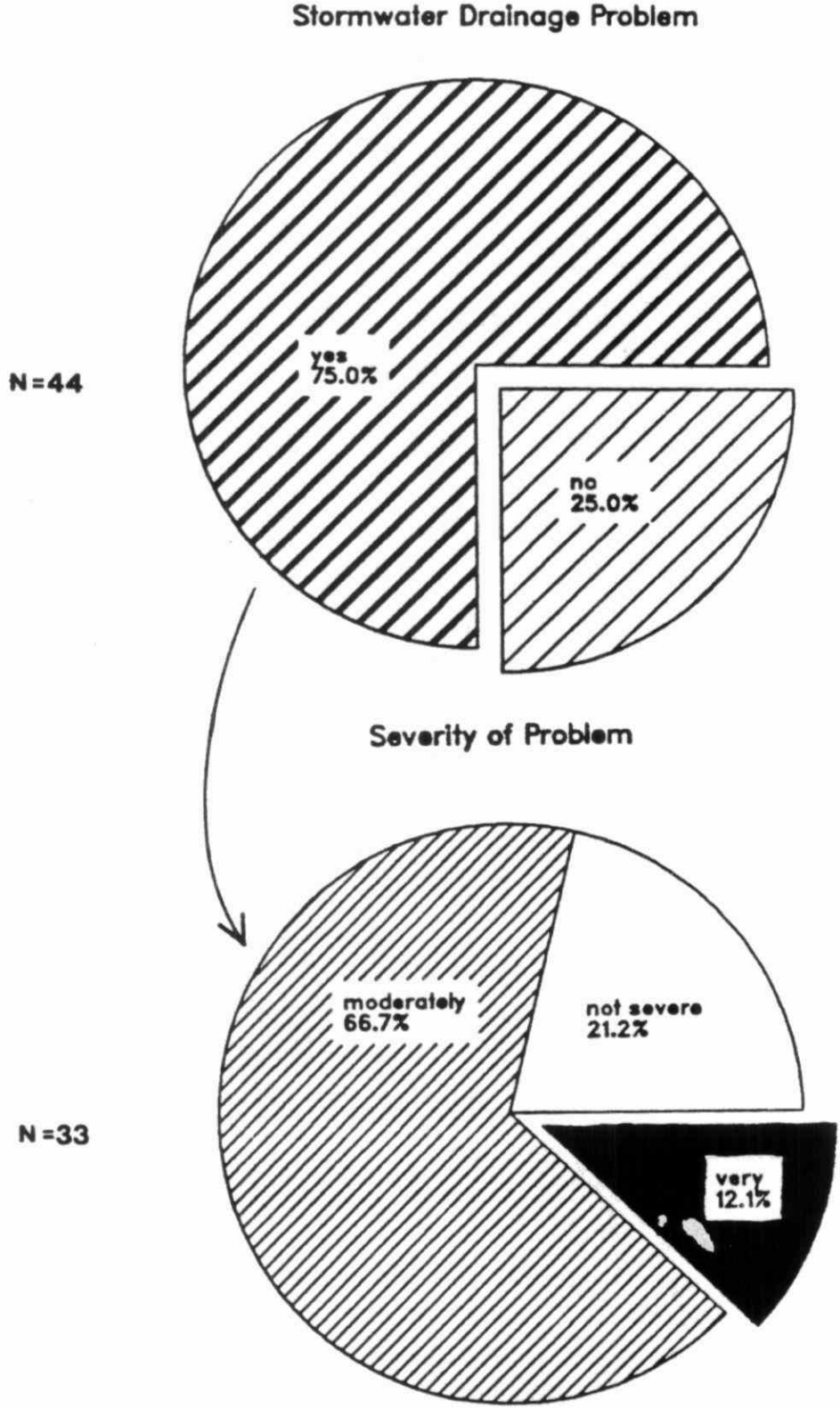
Before delving into the specific details of municipal SWM practices it is useful to gain an understanding of municipal staff's perception of the urban stormwater drainage problem, if indeed they feel one exists, and the specific difficulties resulting from improperly managed runoff.

3.1.1 Perception of the Problem

Of the 44 municipalities utilizing SWM practices, 33 perceive stormwater drainage to be a problem within their boundaries, while the remaining 11 do not feel there is a problem. Several municipalities indicated that stormwater drainage is not a problem due to the adoption of preventative SWM practices. Figure 3 illustrates the perceived severity of the problem among those municipalities responding in the affirmative.

A majority of the respondents, 22 municipalities or 67%, perceive the problem to be moderately severe. A small proportion, 12.1% or 4 municipalities, perceive a very severe problem, and the remaining 21.2% of the respondents feel that the stormwater drainage problem is not severe.

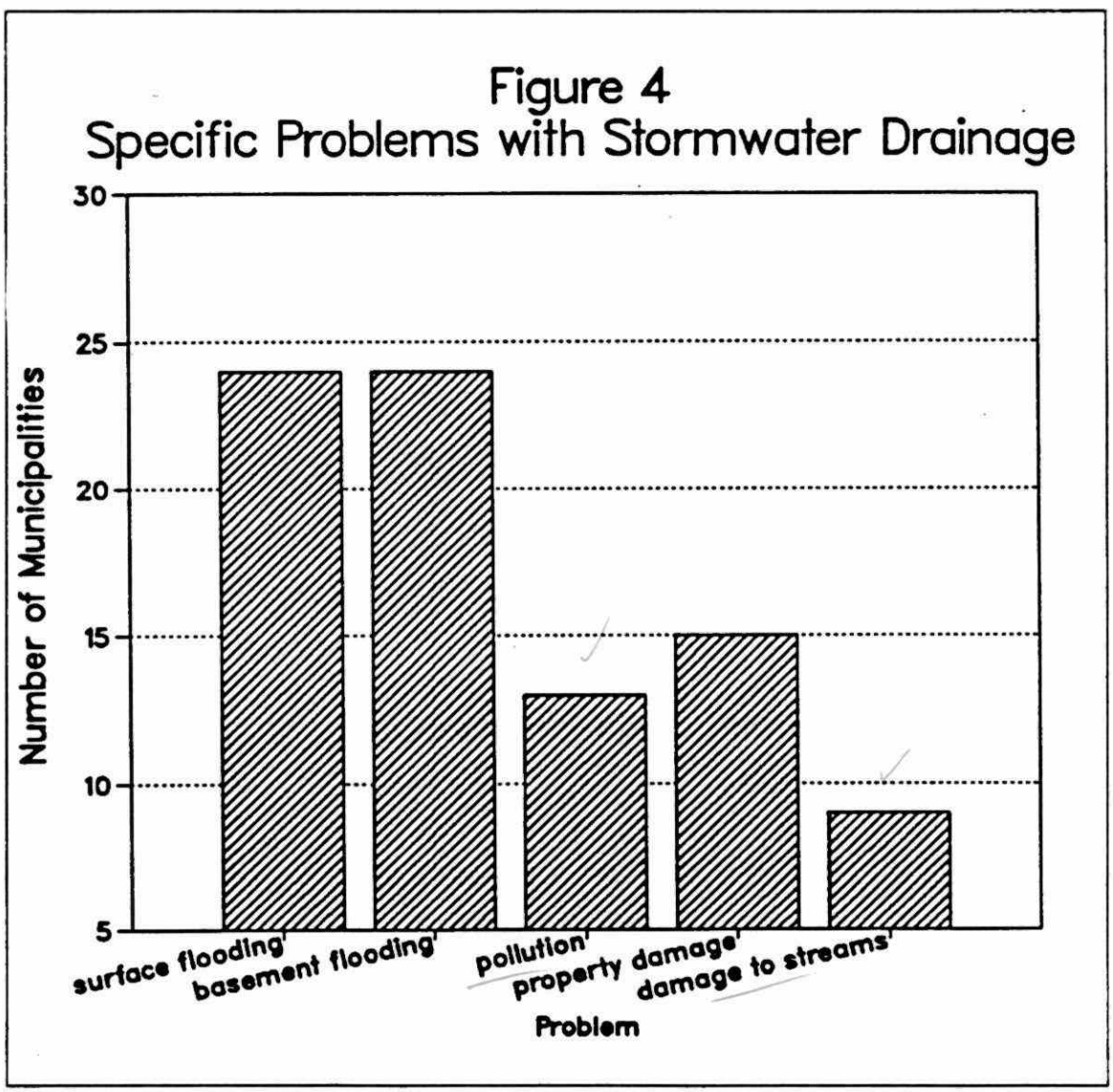
Figure 3
Severity of the Stormwater Drainage Problem



3.1.2 Specific Problems

It is recognized that the problems resulting from improperly managed runoff are frequently local in nature. Respondents were given an open-ended checklist of specific problems commonly associated with urban stormwater drainage and were asked to choose as many as they felt were relevant. Figure 4 provides a breakdown of the frequency with which each specific problem was chosen.

Figure 4
Specific Problems with Stormwater Drainage



Surface flooding and basement flooding are the most widespread problems, occurring in over half of the municipalities utilizing SWM practices. Property damage is a problem in approximately one-third of the municipalities and pollution is acknowledged as a problem by 29.5% of the muncipalities.

3.2 Factors Motivating Implementation of SWM

Respondents were asked to give the reasons why SWM practices were adopted by their municipalites. The three most important factors were ranked to give an indication of their relative importance. Table 3 summarizes the data and includes a weighting of the responses. Factors ranked as 'most important' are given a weight of 3, those ranked 'very important' are given a weight of 2, and third ranked 'important' factors have a weight of 1. The weighting scheme was assigned arbitrarily. Weighted values were totalled to provide an indication of the overall importance of each factor.

Table 3 reveals that flooding complaints by municipal taxpayers, with a total weight of 70 is by far the most significant motivating factor for the implementation of SWM. Twenty municipalities ranked flooding complaints as the most important reason contributing to the adoption of SWM. Two other important motivating factors are "increasing environmental problems" and "requirement of the Conservation Authority" with total weights of 38 and 37, respectively. Six municipalities stated that Conservation Authority requirements were the top-ranked factor. Complaints from downstream municipalities and landowners were not a signicant factor in promoting the implementation of SWM.

The category of "other" with a total weight of 57, including 15 top-ranked responses, requires additional explanation. Respondents had the opportunity to specify a reason(s) of their choice. In reviewing the data it became evident that a

Table 3: Factors Promoting the Implementation of SWM Practices

	# OF RESPONSES			WEIGHTED RESPONSES			
FACTOR	most imp.	very imp.	imp.	most imp.	very imp.	imp.	total weight
flooding complaints	20	4	2	60	8	2	70
increasing env. prob.	2	13	6	6	26	6	38
Cons. Auth. requirement	6	5	9	18	10	9	37
downstream complaints	1	6	2	3	12	2	17
other	15	3	2	45	6	2	53

large majority of the answers fell into 2 groups. The first and more significant group comprises municipalities which recognize the constraints of the existing downstream drainage system, including sewers and natural channels, to new development. This group supports SWM as an alternative to expensive sewer and channel enlargement. Several municipalities stated that SWM was adopted primarily to allow new development without necessitating enlargement of the downstream sewer system. The second group is composed of muncipalities for whom SWM represents a "sound engineering approach" to stormwater drainage. This group recognizes the "potential for storm drainage problems inherent in traditional design" (City of Cornwall) and has adopted SWM to prevent those potential problems.

3.3 SWM Policies

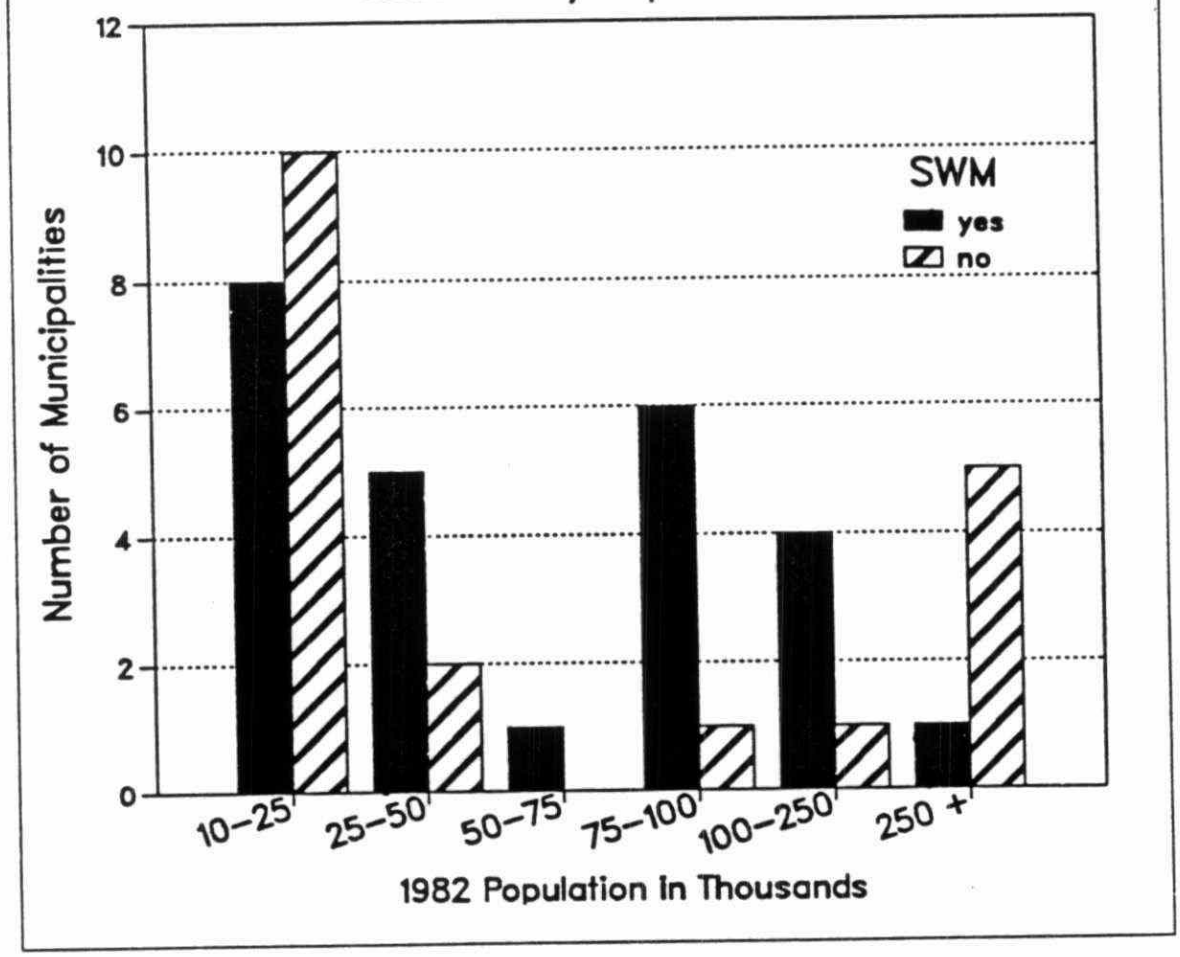
To gain an understanding of a municipality's commitment to SWM, respondents were queried whether their municipality "had urban drainage policies approved by Municipal Council which support stormwater management (SWM) practices" (Questionnaire A, p.2). The assumption behind this inquiry is that municipalities with official policies would use SWM on a consistent daily basis, while those without policies may not use SWM consistently but rather at the discretion of staff and elected officials.

Twenty-five municipalities (35% of respondents) have official policies which support SWM. Municipalities started adopting policies in 1977 and have continued to do so at a fairly constant rate of approximately 2 per year since then. Staff from two municipalities indicated that they plan to introduce policies for Council's approval this year.

When classified by population size it is evident that a majority of mid-sized municipalities utilizing SWM have policies while those at either extreme of population size do not have official policies. A suggested explanation for this relationship is that many of the smaller municipalities, population 10000-25000, do not have the time/money/expertise to compose a set of policies that utilize SWM as part of their standard planning and design practices.

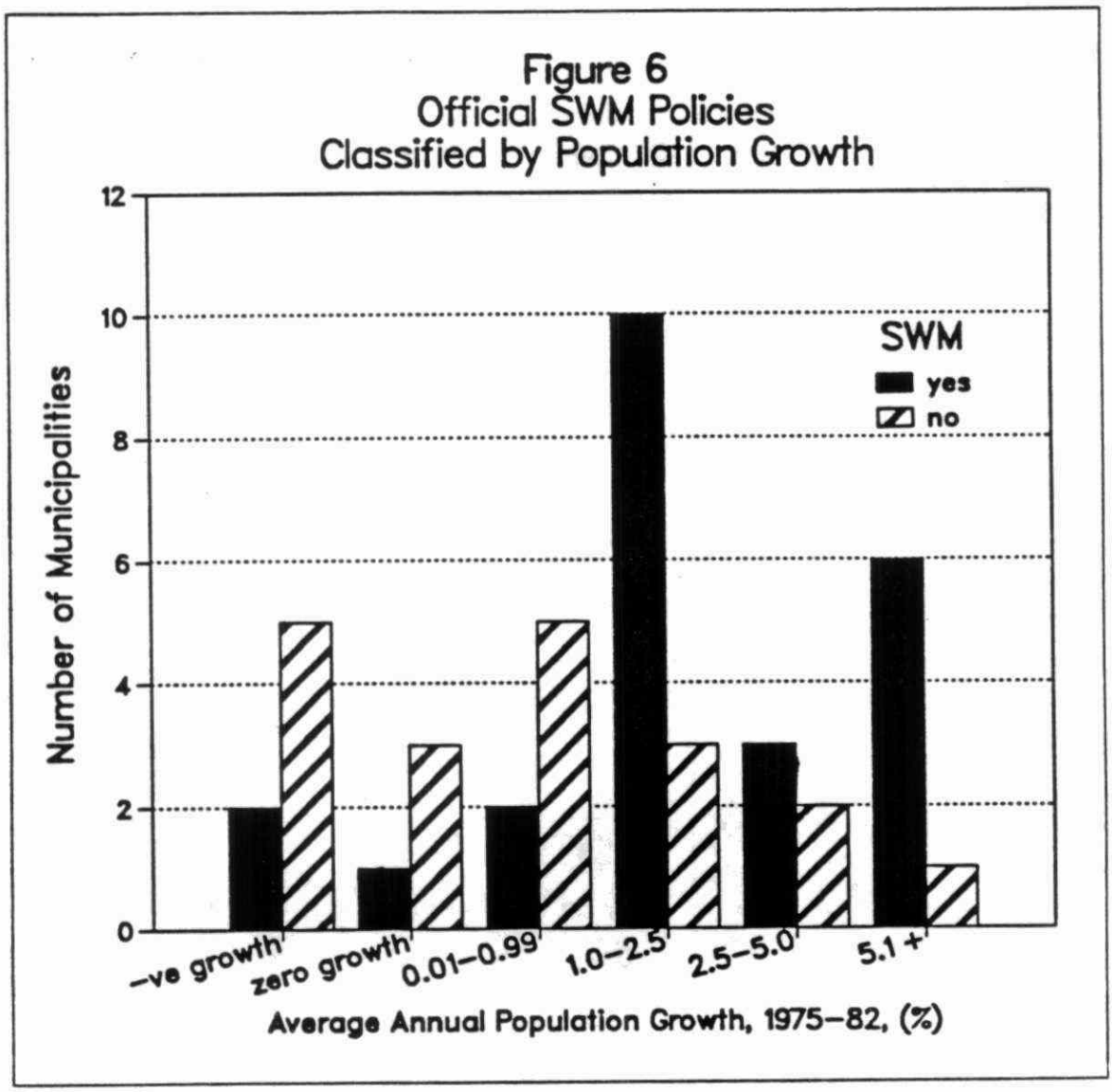
Perhaps more important is the comparison between official SWM policies and the rate of municipal growth. Figure 6 reveals that a majority of the more rapidly growing municipalities have official SWM policies. The division appears to be an average annual growth rate of 1%. Below this rate most municipalities do not have policies. Above this value a significant proportion have adopted policies. This relationship suggests that though the slower growing municipalities do utilize SWM practices, they do not necessarily require official SWM policies. It is suggested

Figure 5
Official SWM Policies
Classified by Population Size



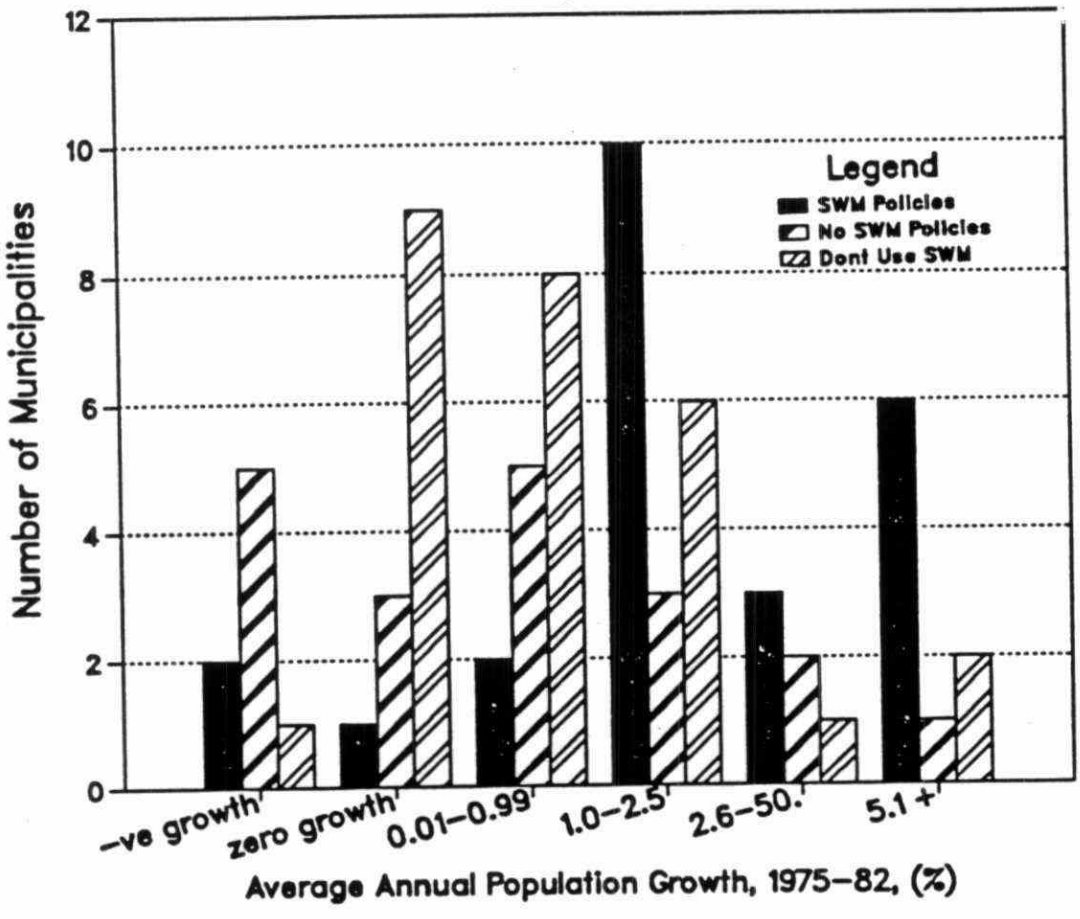
that in the face of strong development pressures rapidly growing municipalities have adopted policies to deal with those pressures.

Figure 7 is similar to Figure 6 with the exception that it includes municipalities not utilizing SWM. In general, Figure 7 suggests that commitment to SWM increases with the rate of growth. Only 1 of 13 municipalities with zero growth has SWM policies, and 3 of that group practise SWM without policies. These values rise slightly in the next group of 0.01 to 0.9% growth, where 2 municipalities have



policies and 5 do not, out of a total of 15. At a growth rate of 1.0 to 2.5% the number of municipalities involved in SWM increases substantially. Ten municipalities in this group have SWM policies, 3 do not have policies and 6 are not utilizing SWM.

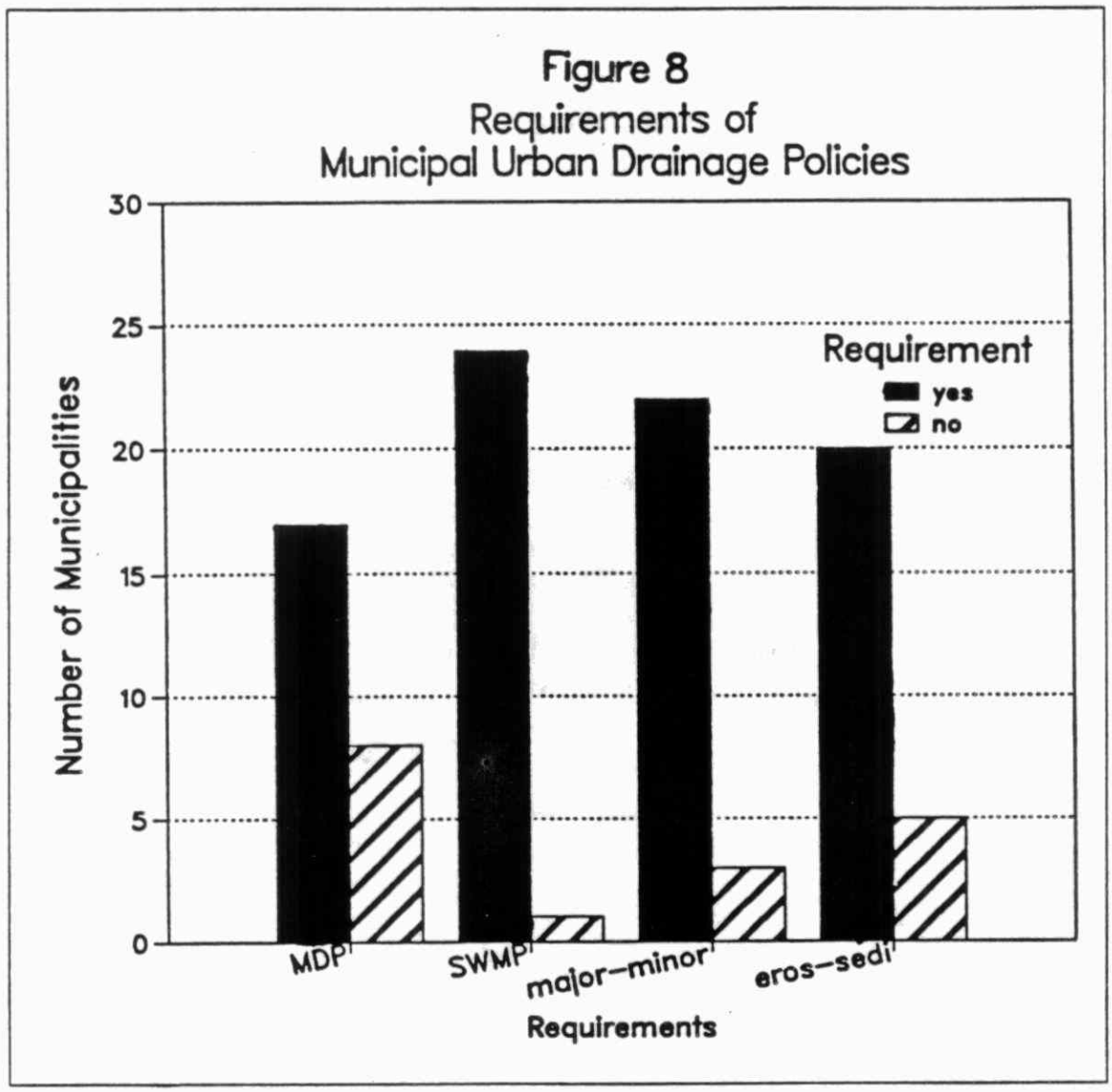
Figure 7
Adoption of SWM Policies
Related to Population Growth



3.3.1 Policy Requirements

There are four basic components common to a comprehensive SWM program. These components are based on good planning and design practices. Included under the former category are Master Drainage Plans and SWM Plans. Under the latter category are major-minor design and erosion and sediment control during construction. Municipalities with SWM policies were asked to identify which of the practices are requirements under the policies. Figure 8 gives a breakdown of the

responses. Not shown in the chart is the fact that 14 of the 25 municipalities require all four components. It can be seen that SWM Plans and the use of major-minor design are the most commom requirements of the policies. Master Drainage Plans are a requirement in only 17 municipalities.



Municipalities which do not have a set of policies were asked what the urban drainage program was based on. The responses are wide-ranging and reveal that a variety of means are used to employ SWM practices. Many municipalities indicat-

ed that they rely upon the policies and guidelines of Conservation Authorities to implement SWM practices. The other most important basis for implementation is the experience and judgement of municipal staff. In these situations any of the four components can be considered necessary at the discretion of staff and Council. However, this approach is weak for it allows many concessions to be made and does not provide a consistent approach to urban drainage management.

3.4 SWM Practices

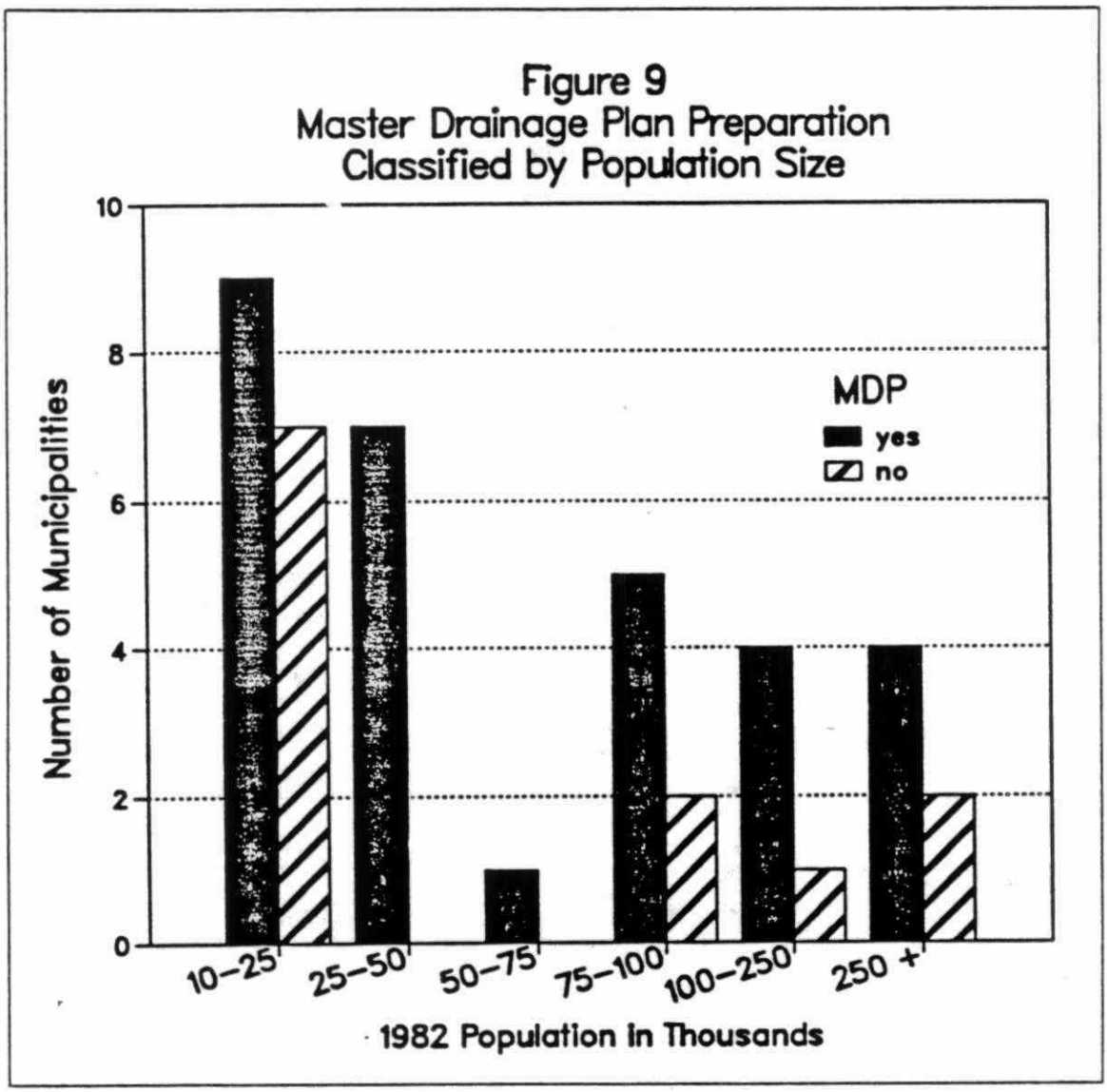
The objective of this sub-section is to investigate the degree of involvement municipalities have had with Master Drainage Planning and SWM Planning.

3.4.1 Master Drainage Plans (MDP)

Thirty municipalities have undertaken Master Drainage Planning. Since only 17 municipalities have an official policy requiring MDPs, it is evident that a policy is not a prequisite for municipal involvement. However, a policy does help ensure application of SWM principles on a consistent basis.

MDPs have been prepared by municipalities of all sizes. Figure 9 indicates that smaller municipalities, population 10000-25000, are not as involved in MDP preparation as the larger municipalities.

Financing of MDPs is often accomplished through the co-operation of a variety of parties. Of the 25 municipalities which have been involved in financing MDPs, only 10 have done so without assistance while the remaining 15 have been assisted by either a developer or a government agency. Five municipalities have not paid any funds for the preparation of MDPs. In 3 cases MDPs were paid for entirely by the developer and in the remaining 2 cases were divided between a developer and a government agency. There is no common means of financing MDPs. Funding appears to be a complex matter requiring negotiation between a



number of parties. Difficulties in arranging funding may be a significant impediment to this important step in urban drainage planning.

Respondents were asked to give an indication of the types of problems they have encountered in attempting to prepare MDPs. Table 4 reveals that the most significant problem is a lack of municipal funds. Thirteen municipalities state that a shortage of funds is the most significant problem. This is particularly acute among municipalities with a population between 10000-25000, with 6 indicating this is their major problem.

Table 4: Problems Encountered in Preparing MDP

PROBLEM	# OF RESPONSES			WEIGHTED RESPONSES			
	most imp.	very imp.	imp.	most imp.	very imp.	imp.	total weight
lack of municipal funds	13	5	1	39	10	1	50
low municipal priority	8	5	5	24	10	5	39
lack of Prov. support	2	6	1	6	12	1	19
lack of staff expertise	0	3	6	0	6	6	12
unco-operative neighbouring municipality	2	0	0	6	0	0	6
other	4	3	0	12	6	0	18

Also a significant problem is the low priority Master Drainage planning has in several municipalities. Eighteen municipalities state that it is a low priority with 8 denoting it is their top-ranked problem. The problems of low priority and lack of funds are inter-related in a number of cases. Nine municipalities indicated that either one of the problems are top-ranked with the other ranking second. The remaining problems do not have the dominance of the above-mentioned factors. Nine municipalities have experienced a lack of support from Provincial agencies, however only 2 attest that this is their most important problem. Under the category of "other", 4 municipalities state that the slow rate of development, particularly of a large scale, precludes the necessity of preparing MDPs. Also mentioned was a lack of computing facilities in-house.

3.4.2 Stormwater Management Plans (SWM Plans)

SWM Plans are produced for the purpose of revealing a development's impact on runoff characteristics and identifying the means of mitigating those impacts. Under ideal circumstances municipalities would require virtually all new development to include SWM Plans as a condition of development. In the preceding section it was revealed that 24 of the 44 municipalities using SWM have policies requiring SWM Plans to be prepared. Figure 10 supports this finding. Nineteen municipalities require SWM Plans to be prepared for *all* new developments. Another 8 require Plans for between 76-99% of new developments.

It is reasonable to expect some exemptions for very small developments and in areas where an MDP shows there is no need for a SWM Plan. Table 5 provides a breakdown of the exemptions municipalities grant to developments. Municipalities indicate that exemptions are most commonly given to small developments where the impact is considered to be insignificant.

Municipal experience in reviewing SWM Plans varies considerably from less than 10 Plans to over 100 (see Figure 11). Thirteen of the 21 municipalities which have reviewed between 1 and 10 SWM Plans belong in the population grouping of 10000-25000. Municipalities with greater experience tend to be larger. An exception to this pattern are very large municipalities with little growth.

Figure 10
New Development Requiring SWM Plans

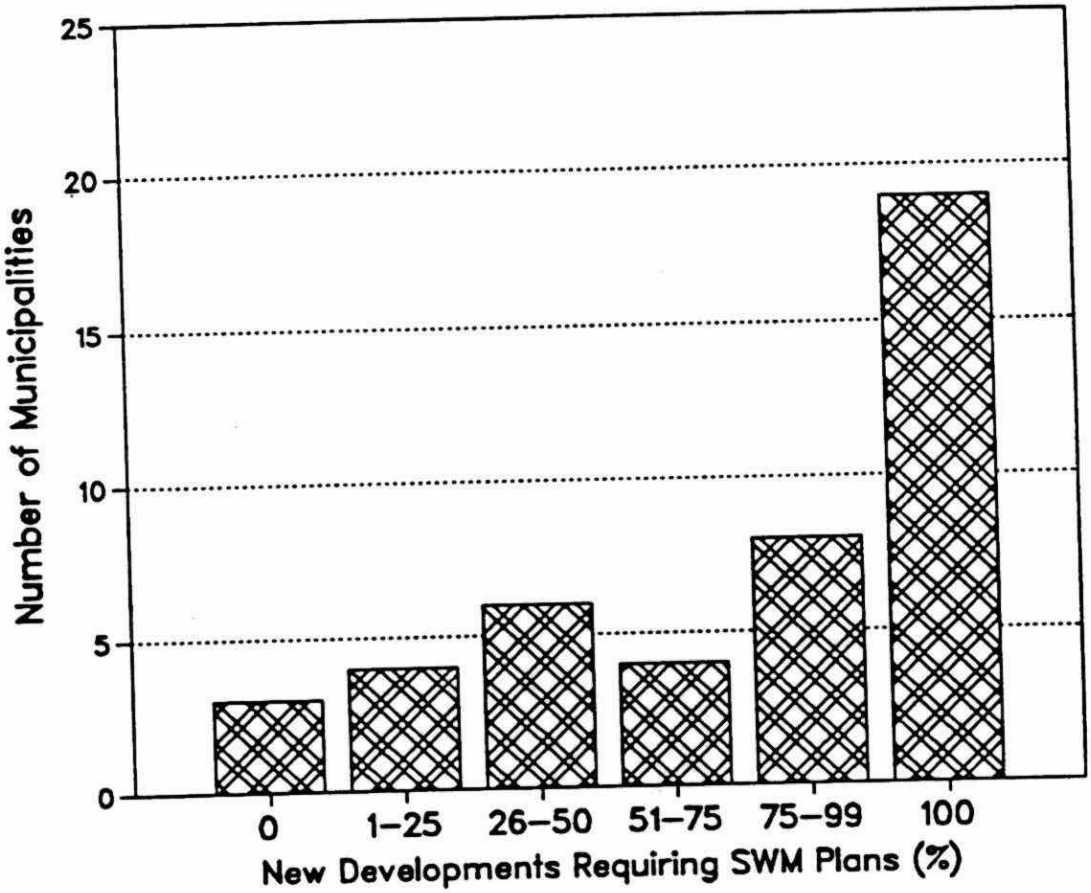
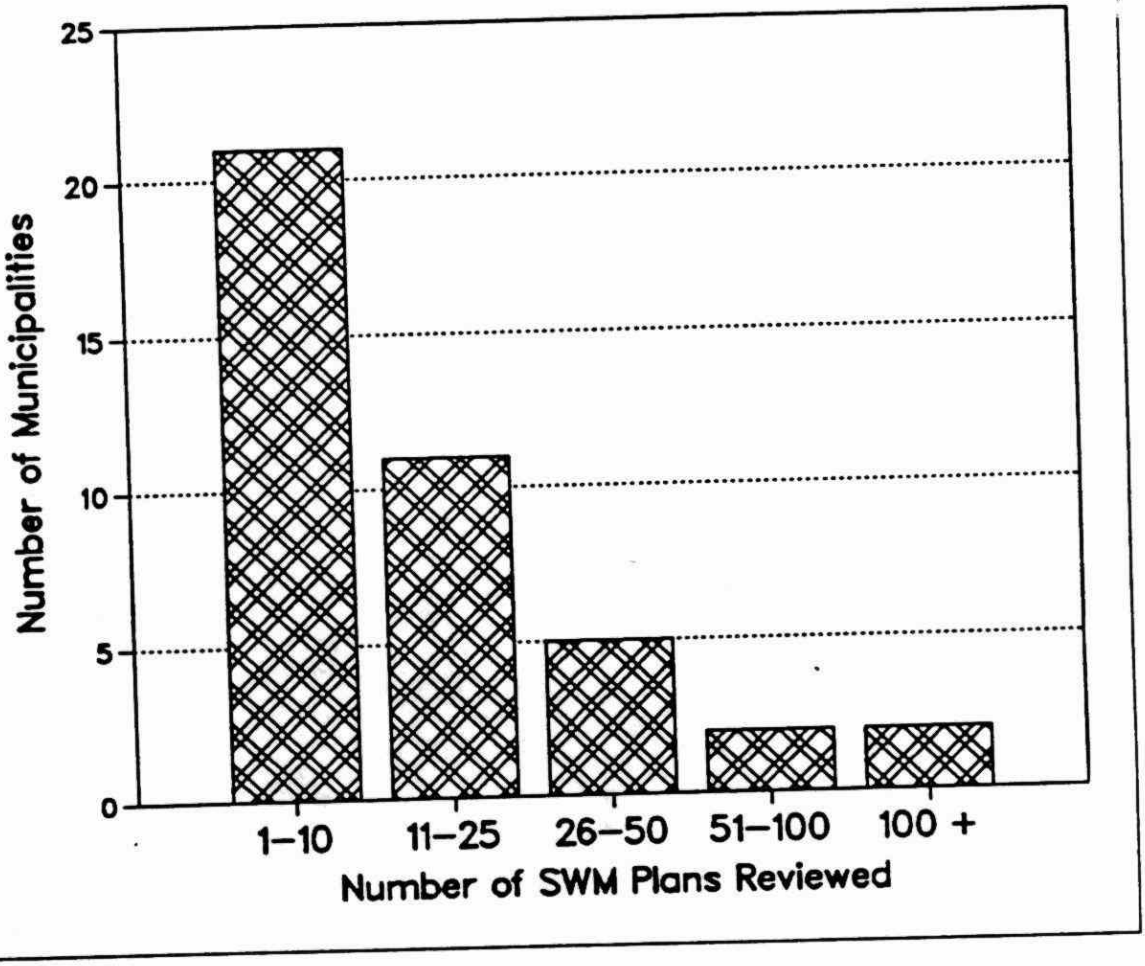


Table 5: Exemptions from SWM Plans

Exemption	# of Municipalities
small size of development	19
MDP shows no need	8
Already have SWM Plan	7
Other	7

Figure 11
SWM Plans Reviewed



3.5 Problems Encountered in Implementing SWM Practices

Municipalities can potentially encounter a variety of stumbling blocks when implementing new urban drainage management practices. It is important to identify these problems to achieve the goal of promoting widespread adoption of SWM. By identifying these problems *now*, measures can be taken to reduce their dominance in the future.

Table 6 categorizes the problems municipalities have encountered. Clearly the most significant problem is a lack of understanding on the part of developers. Twenty municipalities denoted this to be a problem with 12 claiming it was their major difficulty. It is understandable that this problem was encountered. Introducing a new method of managing stormwater runoff necessitates a period of transition during which both municipalities and developers become acquainted with what is required of them. For developers this transition can be particularly frustrating since the learning process can be through trial and error and lead to delays in development approvals. Municipalities can also experience frustration, particularly if they do not have a clear detailed statement of their requirements. The importance of official policies and well defined criteria cannot be underestimated.

Also emerging as a significant problem is a lack of funds at the municipal level. Fifteen municipalities stated this was a problem with a top-ranking among 7. Funds are generally required to; i)write policies and criteria, ii)complete MDPs, whether in-house or through consultants, and iii)review SWM Plans submitted by developers. To accomplish these tasks, staff need basic training in stormwater drainage design and require the availability of computer hardware and software. Achieving these objectives through consultants can be an expensive proposition.

Lack of staff expertise was mentioned as a problem by 8 municipalities. Municipal staff must go through a period of training before becoming fully competent in SWM practices. The remaining problems listed in Table 6 are not very significant.

Table 6: Problems Encountered in the Implementation of SWM

PROBLEM	# OF RESPONSES			WEIGHTED RESPONSES			
	most imp.	very imp.	imp.	most imp.	very imp.	imp.	total weight
lack of developer understanding	12	5	3	36	10	3	49
lack of municipal funds	7	4	4	21	8	4	33
lack of staff expertise	2	2	4	6	4	4	14
lack of Prov. support	4	0	1	12	0	1	13
lack of political commitment	0	4	1	0	8	1	9
communication between munici. departments	0	3	0	0	6	0	6
lack of Cons. Auth. support	0	1	2	0	2	2	4
unco-operative neighbouring municipality	0	1	0	0	2	0	2
other	3	2	0	9	4	0	13

Section IV

MUNICIPALITIES NOT UTILIZING SWM PRACTICES

4.1 Problems with Stormwater Drainage

4.1.1 Perception of the Problem

A large percentage of the 27 municipalities not utilizing SWM practices perceive stormwater drainage to be a problem. Twenty-two municipalities state that stormwater drainage is a problem while 5 do not perceive a problem. The perceived severity of the problem is illustrated in Figure 12.

The results are very comparable to those for municipalities utilizing SWM practices (see Table 7). Fourteen municipalities, or 51.9%, perceive the problem to be moderately severe. Only 2 municipalities, or 7.4% of the group, perceive a very severe problem. Perception of the stormwater drainage problem alone is not a significant factor motivating the implementation of SWM.

Figure 12
Severity of Stormwater Drainage Problem Among Municipalities Not Using SWM

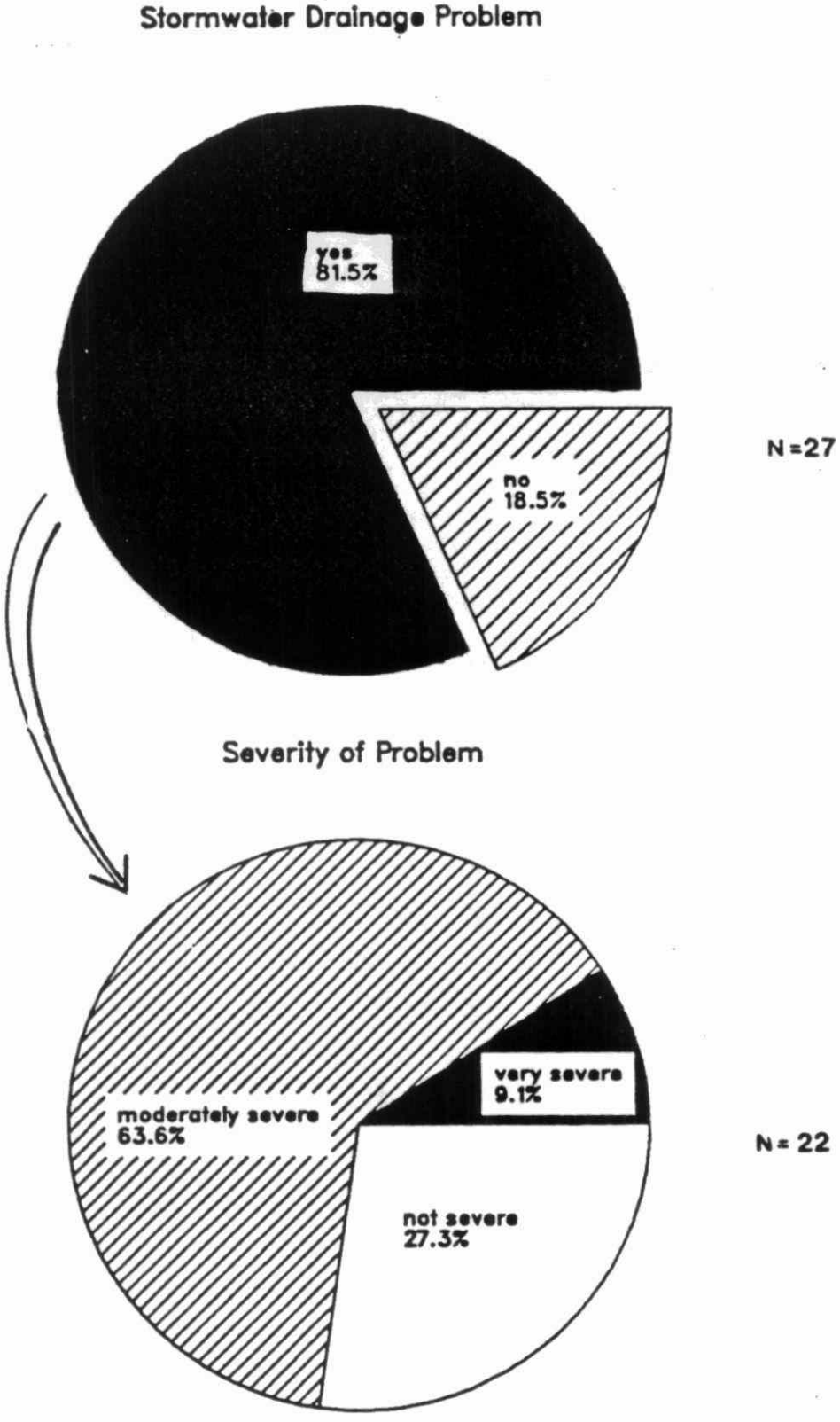


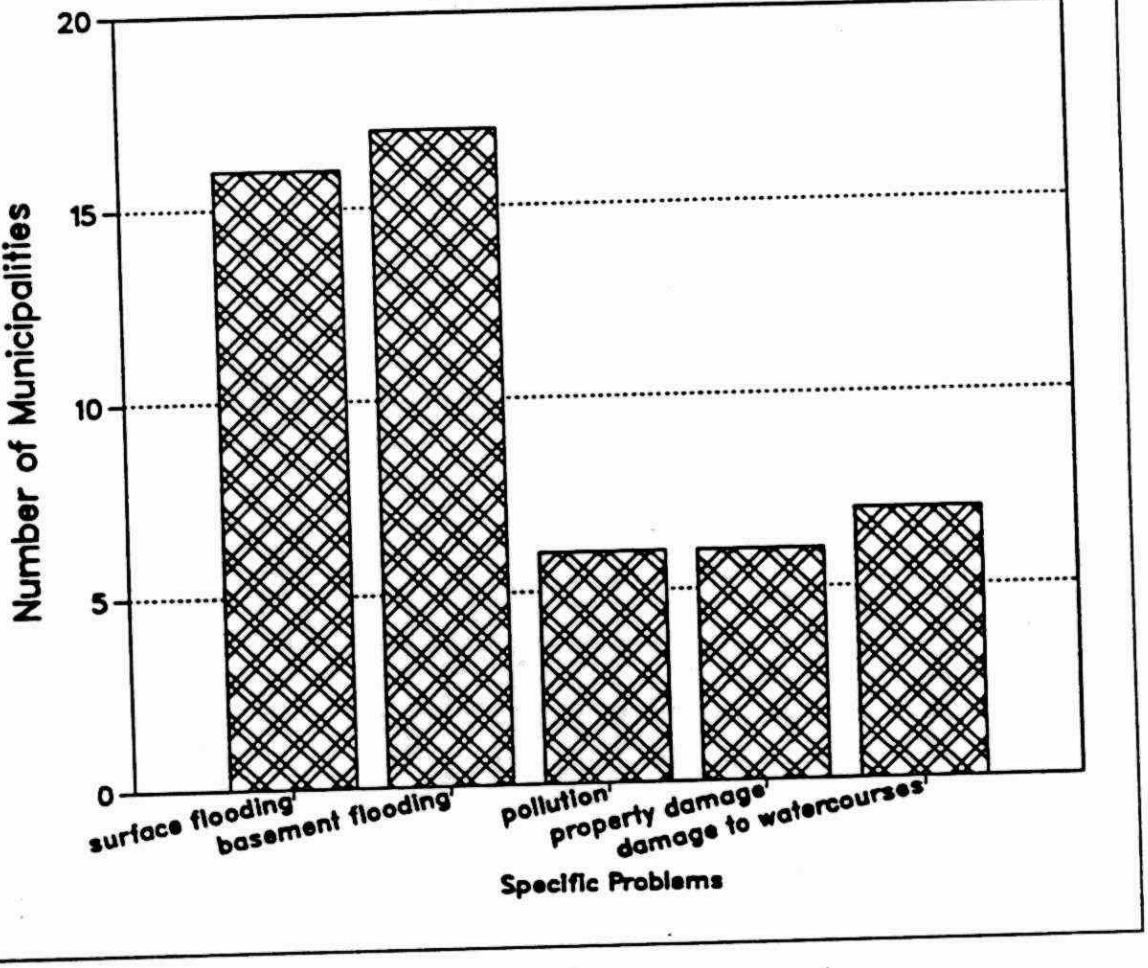
Table 7: Perception of the Stormwater Drainage Problem

Perception of Problem	Munici. with SWM #	Munici. with SWM %	Munci. without SWM #	Munci. without SWM %
not a problem	11	25.0	5	18.5
not severe	7	15.9	6	22.2
moderately severe	22	50.0	14	51.9
very severe	4	9.1	2	7.4
totals	44	100.0	27	100.0

4.1.2 Specific Problems

Figure 13 provides a breakdown of the frequency with which specific problems occur. As with municipalities which utilize SWM practices, it can be seen that approximately 60% of the respondents not using SWM suffer from surface and basement flooding. The remaining problems are not as widespread, noted by approximately one-quarter of the respondents.

Figure 13
Problems with Stormwater Drainage in Municipalities Not Using SWM



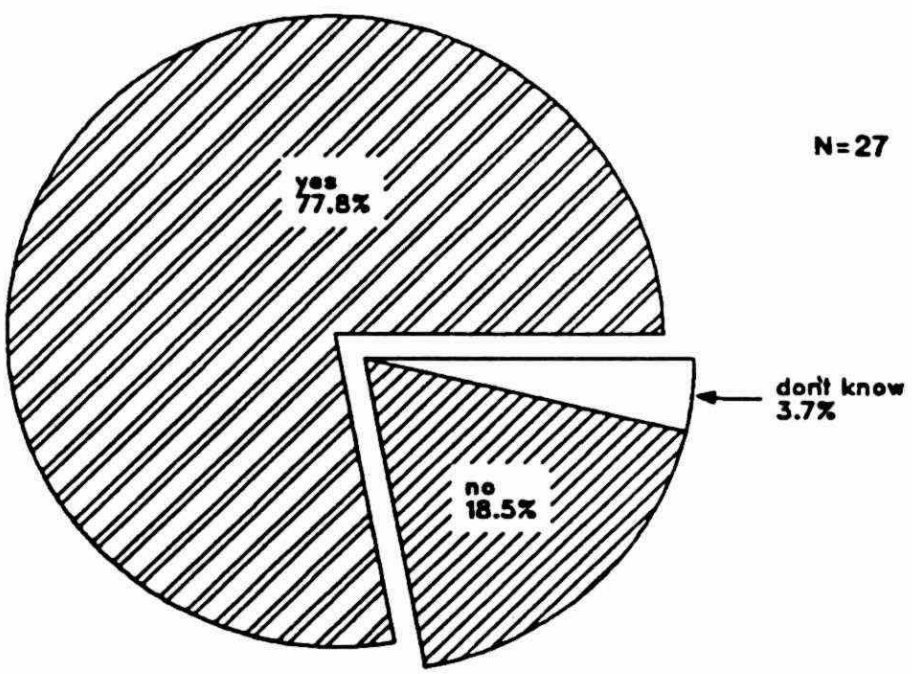
4.2 Need for SWM Practices

Municipalities have primary responsibility for urban drainage and as such they have the ability to select the approach to stormwater drainage considered to be most responsive to its needs. It can be seen that the implementation of SWM practices largely hinge on a municipality's desire to adopt this new approach. To gain an understanding of the degree of support for SWM practices, municipal staff

were asked if "there is need for an urban drainage program utilizing SWM practices in your municipality" (Appendix II, Questionnaire B, p.1).

Responses to this question, as shown in Figure 14 reveal a very strong desire to adopt SWM practices. Twenty-one of 27 municipalities currently not utilizing SWM practices indicated there is a need to adopt these practices. Only 5 or 18.5% of the respondents indicated there is no need for SWM. One respondent did not know whether there is a need for SWM.

Figure 14
Need for SWM Practices



When broken down according to population size, municipalities from every grouping perceive a need to adopt SWM (see Figure 15). The desire to adopt SWM is particularly strong among smaller municipalities, population 10000-25000, with 11 of 15 municipalities indicating SWM is desired.

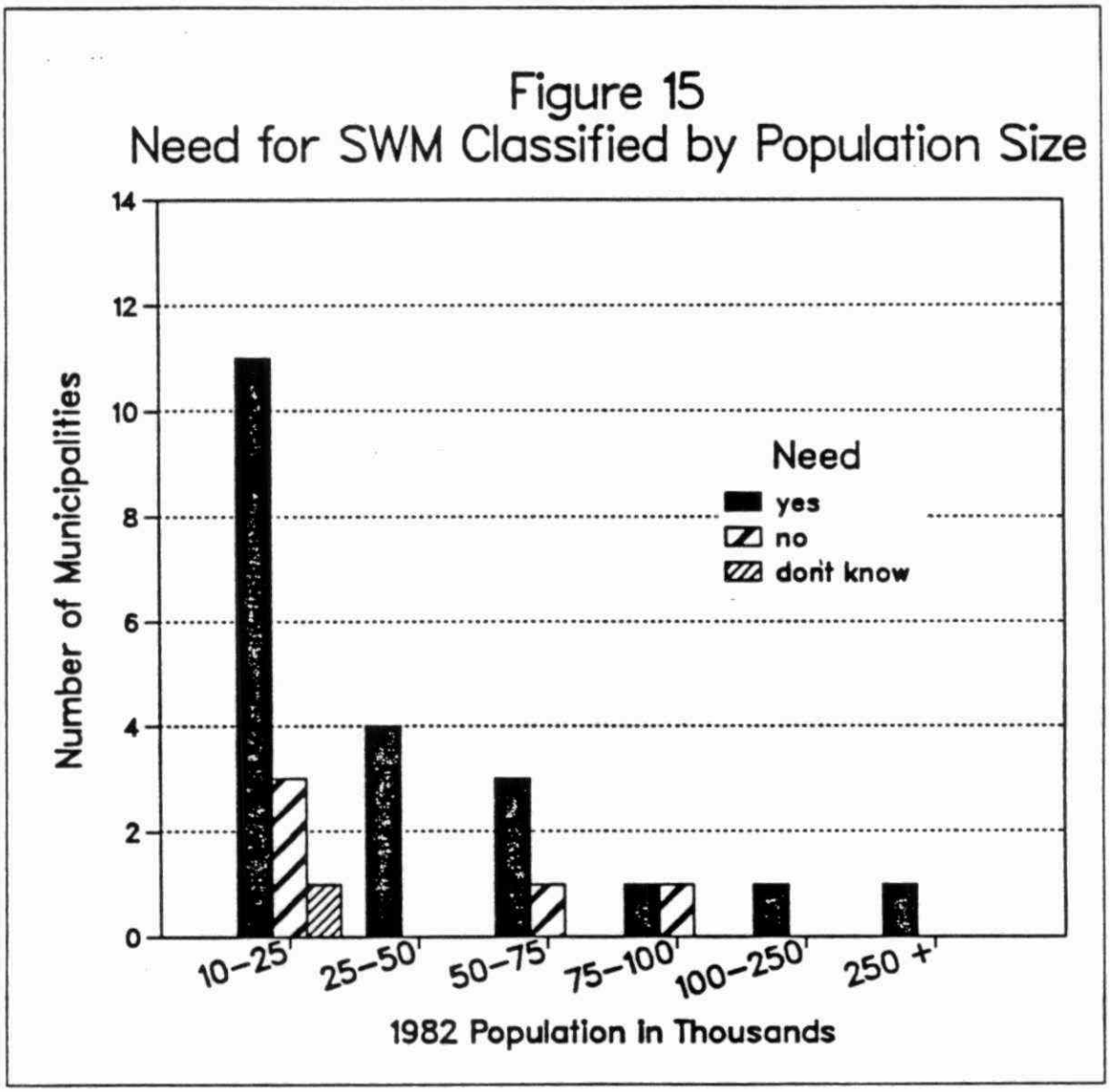
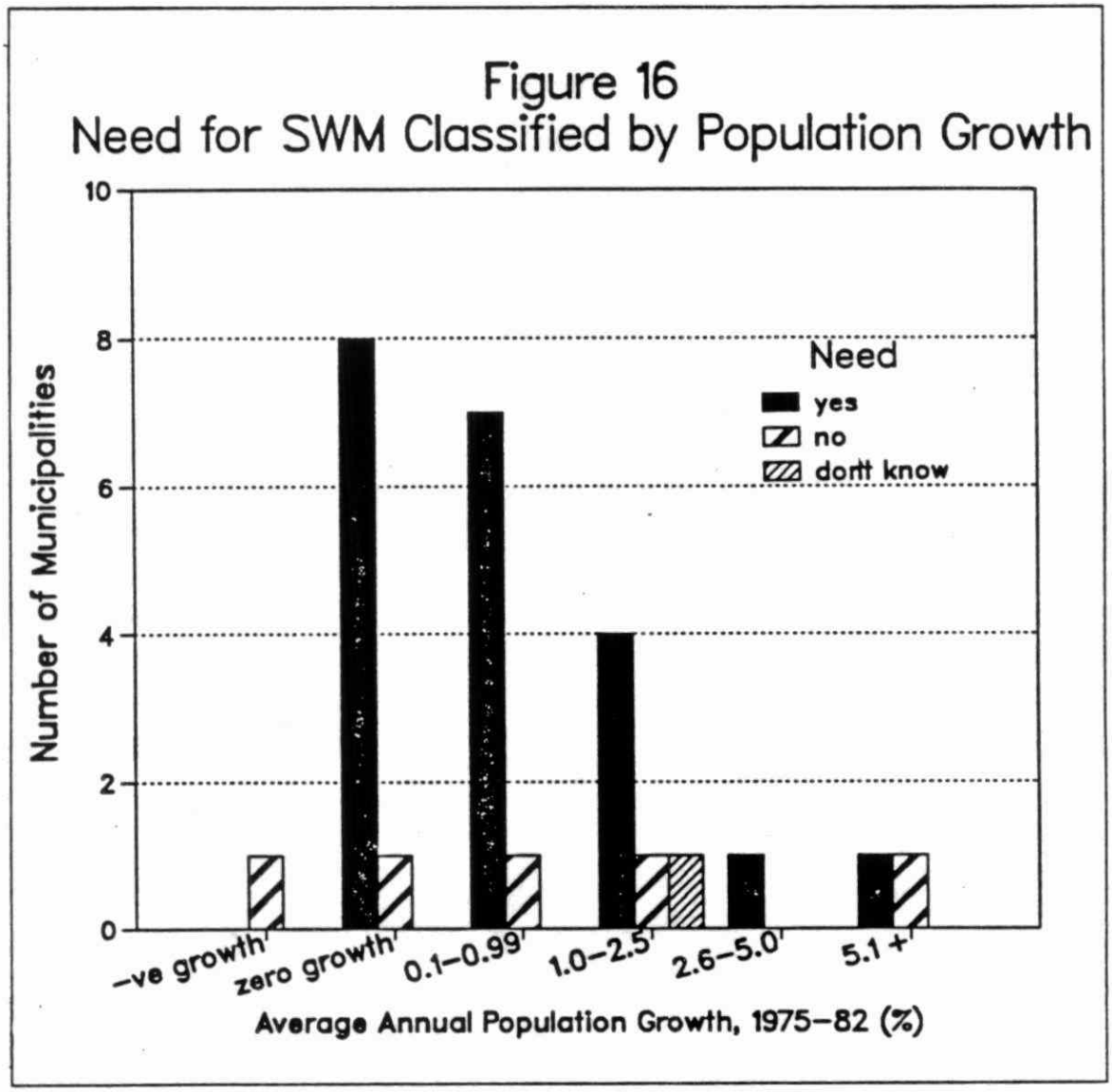


Figure 16 classifies the perceived need for SWM according to population growth. A majority of the municipalities not utilizing SWM are relatively slow growing, ranging between 0 and 1% average annual growth. Perceived need for

SWM is strong among these municipalities. Municipalities perceiving no need for SWM are spread equally through all the various rates of growth. These respondents were asked to give reasons why they perceive no need for SWM. Municipalities experiencing a decline in population (e.g. Sudbury) or zero growth (e.g. Norfolk Township) stated that SWM is not needed due to little new development occurring in their municipality. North Bay, which has experienced very slow growth, and Sarnia Township, which has experienced very rapid growth, both remark that the approach they are presently using is satisfactory. North Bay and Sudbury also added that SWM is the responsibility of the Conservation Authority.

Figure 16
Need for SWM Classified by Population Growth



4.3 Impediments to the Implementation of SWM Practices

To promote widespread adoption of SWM it is helpful to identify the factors impeding its implementation. Respondents from municipalities not using SWM practices were asked to rank the impediments encountered to date. Results of the findings are provided in Table 8.

Table 8 clearly indicates that a shortage of municipal funds is the main impediment to the adoption of SWM practices. Sixteen municipalities noted this as

Table 8: Impediments to the Implementation of SWM

IMPEDIMENT	# OF RESPONSES			WEIGHTED RESPONSES			
	most imp.	very imp.	imp.	most imp.	very imp.	imp.	total weight
lack of municipal funds	12	2	2	36	4	2	42
lack of staff expertise	2	3	5	6	6	5	17
lack of Prov. policy	4	1	2	12	2	2	16
lack of political commitment	0	4	1	0	8	1	9
lack of training and education programs	0	3	2	0	6	2	8
lack of Prov. support	0	2	2	0	4	2	6
lack of Cons. Auth. support	0	1	0	0	2	0	2
other	3	1	0	9	2	0	11

a problem for a total weight of 42. In comparison, the next most significant impediment has a total weight of 17. A lack of funds is the top-ranked impediment for 12 municipalities. It should be noted that these municipalities are relatively small, with 10 having a population ranging between 10000-25000 and the remaining 2 being between 25000-50000. It is suggested that smaller municipalities do not have funds available to undertake SWM on their own or through the use of consultants.

Ten municipalities stated that a lack of staff expertise is an impediment. This is a problem which could easily be overcome with training and education programs. The lack of Provincial policy on urban drainage management closely follows as the third ranked impediment. Four municipalities claim this their most important impediment to the adoption of SWM. Three of these municipalities are large with populations in excess of 50000. Among these municipalities, funding does not pose as significant an impediment as the lack of a clearly defined Provincial policy on the status of SWM practices in urban drainage management.

Under the category of "other", 2 respondents indicated that stormwater drainage problems in their municipality have not been severe enough to warrant the implementation of SWM practices. Also mentioned as a significant impediment was the lack of financial support received from the Province and Conservation Authority. The remaining problems listed in Table 8 are applicable to a limited number of municipalities and are not top-ranked.

4.4 Voluntary Adoption of SWM Practices

In the absence of a Provincial policy requiring municipalities to implement SWM practices as part of their urban drainage program, it is necessary to understand what factors would convince municipalities to adopt SWM voluntarily.

Table 9 reveals the responses to this area of inquiry. A majority of the municipalities indicated that increased flooding complaints from municipal taxpayers would induce the voluntary adoption of SWM practices. Additional Provincially sponsored training and education programs were also noted as an important factor. Twelve municipalities stated that a greater transfer of technology would encourage voluntary adoption of SWM. The remaining factors were not considered overly significant.

Table 9: Inducements to Voluntarily Implement SWM

INDUCEMENT	# OF RESPONSES			WEIGHTED RESPONSES			
	most imp.	very imp.	imp.	most imp.	very imp.	imp.	total weight
flooding complaints	16	7	2	48	14	2	64
training and education programs	3	5	4	9	10	4	23
increasing environmental problems	3	6	1	9	12	1	22
downstream complaints	3	3	2	9	6	2	17
other	2	3	1	6	6	1	13

Section V

ROLE OF THE PROVINCE

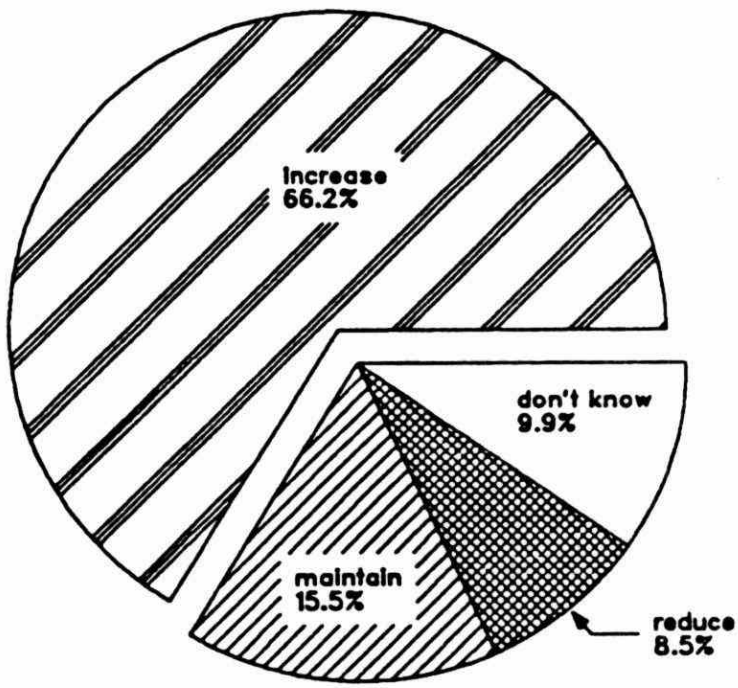
5.1 Provincial Promotion of SWM

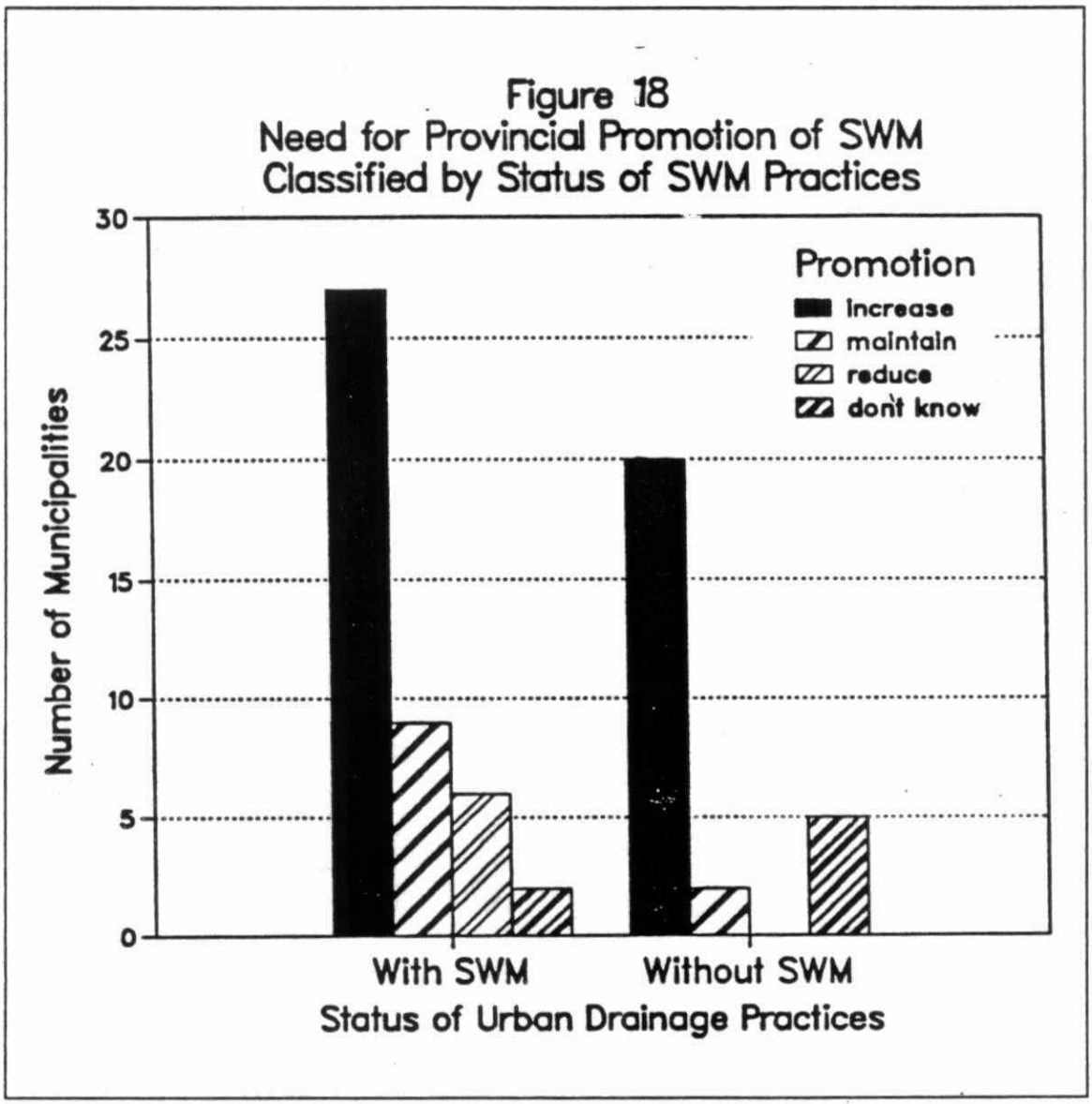
5.1.1 Need for Promotion

A majority of the respondents indicate a need for the Provincial government to more actively promote SWM practices. As seen in Figure 17, 47 municipalities denoted a need for additional promotion at the Provincial level. Of the 17 municipalities which stated that there is no need for increased promotion, 11 felt that the Province should maintain its existing involvement and only 6 suggested that the Province reduce its involvement. Seven respondents did not know if the Province should promote SWM more actively.

Support for a heightened role is particularly strong among those municipalities currently not utilizing SWM. Figure 18 reveals that 20 municipalities would like the Province to take a stronger role while only 2 do not want the Province to become more involved. These 2 municipalities state that the Province should maintain its existing involvement. Among municipalities using SWM, support is slightly weaker. Twenty-seven municipalities see a need for increased promotion, and 15 do not perceive a need. Of the latter group, 9 suggest the Province maintain its role and the remaining 6 would prefer the Province reduce its involvement. This higher level of disenchantment with Provincial government among municipalities utilizing SWM practices suggests that some difficulties have been encountered by a small number of municipalities.

Figure 17
Need for Provincial Promotion of SWM





5.1.2 Provincial Measures to Promote SWM

Municipalities which indicated a need for the Province to more actively promote SWM practices were asked what measures the government should take to do so. Results are given in Table 10.

Provincial subsidization of MDPs is the most highly desired measure. With a total weight of 89, twenty municipalities gave subsidization a top-ranking. This is particularly true among municipalities not using SWM where 9 declared subsidiza-

Table 10: Preferred Measures to Promote SWM

MEASURE	# OF RESPONSES			WEIGHTED RESPONSES			
	most imp.	very imp.	imp.	most imp.	very imp.	imp.	total weight
subsidize MDPs	20	13	3	60	26	3	89
offer train. and educ. programs	9	16	12	27	32	12	71
make SWM legal requirement	10	4	2	30	8	2	40
one agency for SWM	2	7	12	6	14	12	32
other	6	2	0	18	4	0	22

tion is the most important measure. This response is consistent with earlier analyses revealing that a shortage of funds was the most significant impediment to adoption among municipalities not using SWM, and was a second ranked problem encountered by municipalities which have adopted SWM practices.

Provincially sponsored training and education programs were noted by 37 municipalities as an important measure to promote SWM. This is particularly true among municipalities which are already using SWM. Eight municipalities in this category view training and education programs as the most important measure and another eight view such programs as a second ranked measure. Making SWM practices a legal requirement of all new developments is favored by 16 municipalities, of which 10 state it is the most important measure the Province could take. Assigning one Provincial agency to deal with SWM concerns is generally not considered an important measure.

5.2 Education and Training Programs

In the absence of a Provincial policy supporting SWM, UDPIC will have to rely on voluntary implementation. As indicated by municipalities in the preceding section, a strong demand exists for Provincially sponsorred training and education programs as a means of promoting SWM practices.

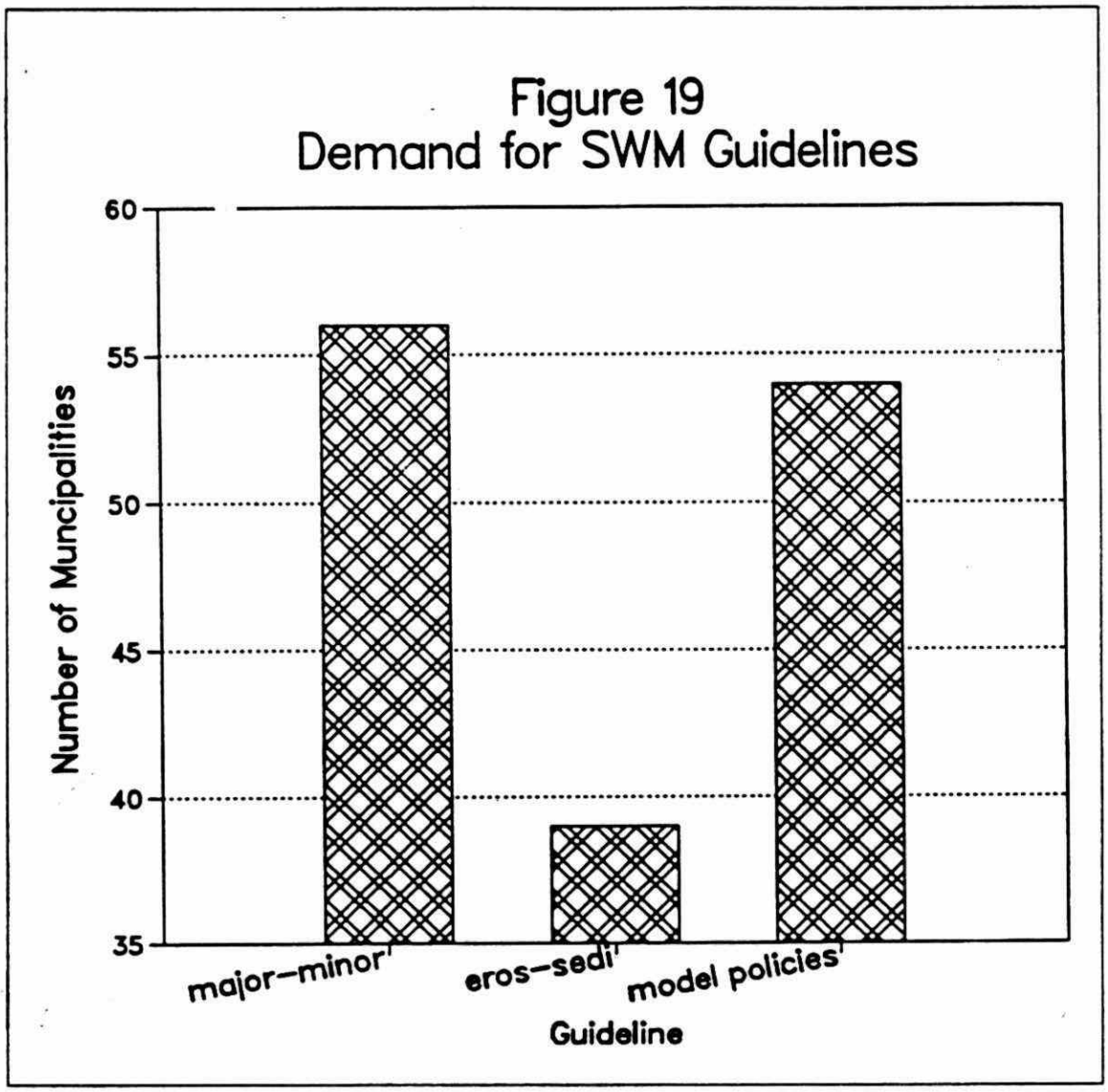
5.2.1 SWM Guidelines

Respondents were asked to give an indication of the types of SWM guidelines that would be used by their staff. The findings are revealed in Figure 19. There is very strong demand for guidelines on major-minor drainage design and model urban drainage management policies. Demand for guidelines on erosion and sediment control during construction is not as pronounced.

Fifty-six municipalities, or 79% of the respondents, indicated that they would use guidelines on major-minor drainage design. Demand is particularly strong from smaller municipalities where 40 of 44 municipalities with populations less than 50000 would make use of the guidelines. Municipalities not wanting guidelines are generally either experiencing no population growth or are already familiar with major-minor design.

Demand for policy guidelines is very strong with 54 municipalities, or 76% of the respondents, indicating such guidelines would be useful. Demand is fairly consistent from municipalities which do not already have policies, while several municipalities which have a set of comprehensive policies do not require guidelines.

Demand for erosion and sediment control guidelines is relatively weak with 39 municipalities, or 55%, indicating a desire for guidelines. It is unknown whether this is due to municipal staff being acquainted with control measures or a perception that erosion and sedimentation is relatively unimportant.



5.2.2 Training Courses

Respondents were asked to rank the areas in which they require training. Table 11 indicates that there is a very strong demand for training staff to competently review MDPs and SWM Plans submitted by consultants.

Training in major-minor design is also strongly desired. Thirteen municipalities gave this area a top ranking and 26 gave it a ranking of very important. Training in the preparation of MDPs in-house was ranked first by 16 municipalities.

Table 11: Demand for Training Courses

TRAINING COURSE	# OF RESPONDENTS			WEIGHTED RESPONSES			
	most imp.	very imp.	imp.	most imp.	very imp.	imp.	total weight
review MDP/SWMP	32	14	3	96	28	3	127
major-minor design	13	26	9	39	52	9	100
prepare MDPs in-house	16	8	8	48	16	8	72
erosion and sediment control	3	11	16	9	22	16	47

A majority of municipalities indicated that they would send between 1 and 3 staff members to training courses. The preferred length of the courses is 2 days with several municipalities indicating longer courses are acceptable for intensive training. Municipalities not using SWM tend to favour longer courses. A fee of $100 per employee per course is acceptable to a majority of municipalities.

Appendix A

QUESTIONNAIRES

QUESTIONNAIRE "A"
FOR
MUNICIPALITIES UTILIZING STORMWATER MANAGEMENT PRACTICES

Name of Respondent _____

Position _____

Municipality _____

1) Problems with Stormwater Drainage

i) In your opinion, is stormwater drainage a problem in your municipality?

__ YES __ NO __ DON'T KNOW

ii) If YES, how severe is the problem?

__ a) very severe __ b) moderately severe

__ c) not severe

iii) If YES, why is it a problem? Please check as many as applicable.

__ a) surface flooding __ b) basement flooding

__ c) pollution __ d) property damage

__ e) damage to watercourse __ e) other(s), please specify

_____

2) Details of Urban Drainage Management Program

i) Which of the following factors promoted the adoption of stormwater management (SWM) practices? Please check as many as applicable.

__ a) increasing environmental problems

__ b) flooding complaints by municipal taxpayers

__ c) complaints from downstream municipalities and landowners

__ d) requirement of Conservation Authority

__ e) other(s), please specify _____

_____

Of the factors checked above, choose the three that were most important in promoting the adoption of stormwater management (SWM) practices. Rank them below according to the letter of the alphabet in front of each factor.

RANK 1 (most important) ___

2 ___

3 ___

ii) Are the stormwater management (SWM) practices primarily intended to:

__ a) prevent problems in new developments

__ b) solve problems in existing developments

__ c) address problems downstream

__ d) deal equally with a), b), and c)

__ e) other, please specify _____

3) Urban Drainage Policies

i) Does your municipality have a set of urban drainage policies approved by Municipal Council which support stormwater management (SWM) practices

__ YES __ NO __ DON'T KNOW

ii) If YES, what year were the policies adopted? _____

iii) Which of the following are requirements under the policies? Please check as many as applicable.

__ a) Master Drainage Plans

__ b) Stormwater Management Plans

__ c) use of major-minor drainage design

__ d) erosion and sediment control during construction

iv) If your municipality does NOT have a set of policies, what is the urban drainage program based on? Please specify.

_____

4) Master Drainage Plans

i) Has your municipality undertaken Master Drainage Planning?

__ YES __ NO __ DON'T KNOW

ii) If YES, how many Master Drainage Plans have been completed and are in the process of being completed?

_____

iii) How are Master Drainage Plans financed?

__ a) by municipality __ b) by developer

__ c) by Provincial Ministry __ d) by Conservation Authority

__ e) other, please specify _____

_____

iv) Have any of the following factors acted as obstacles in attempting to prepare Master Drainage Plans? Please check as many as applicable.

__ a) low municipal priority

__ b) lack of municipal funds

__ c) lack of technical expertise among staff

__ d) lack of co-operation with adjoining municipalities

__ e) lack of Provincial support

__ f) other(s), please specify _____

_____

Of the factors checked above, choose the three most important obstacles to the development of Master Drainage Plans. Rank them below according to the letter of the alphabet in front of each factor.

RANK 1 (most important) ___

2 ___

3 ___

5) Stormwater Management Plans

i) Are Stormwater Management Plans produced for <u>all</u> new developments?

__ YES __ NO __ DON'T KNOW

ii) Estimate the number of Stormwater Management Plans which have been completed and are in the process of being completed.

__ a) 1-10 __ b) 11-25 __ c) 26-50

__ d) 51-100 __ e) more than 100

iii) If Stormwater Management Plans are <u>not</u> produced for <u>all</u> new developments estimate the percentage of new developments which have required Stormwater Management Plans.

_____

iv) If Stormwater Management Plans are <u>not</u> produced for <u>all</u> new developments, which of the following factors permit exemption? Please check as many as applicable.

__ a) small size of development

__ b) Master Drainage Plan indicates no need

__ c) Stormwater Management Plan already in place

__ d) other, please specify _____

_____

6) Problems in implementing Stormwater Management (SWM) Practices

i) Which of the following problems has your municipality encountered in the implementation of SWM practices? Please check as many as applicable

__ a) lack of support from Provincial Ministries

__ b) lack of support from Conservation Authority

__ c) lack of understanding on part of developers .

__ d) lack of municipal funds

__ e) lack of political commitment at municipal level

__ f) lack of technical expertise among staff

__ g) communication problems between municipal departments

__ h) lack of co-operation from adjoining municipalities

__ i) other, please specify _____

_____

Of the factors checked above, choose the three most significant problems encountered in the implementation of SWM practices. Rank them below according to the letter of the alphabet in front of each factor.

RANK 1 (most important) ___

2 ___

3 ___

7) Role of the Province

i) In your opinion, is there a need for the Provincial Government to more actively promote stormwater management (SWM) practices?

__ YES __ NO __ DON'T KNOW

ii) If YES, which of the following measures should the Provincial Government take? Please check as many as applicable.

__ a) making SWM practices a legal requirement of all new developments

__ b) subsidizing Master Drainage Plans

__ c) assigning one Provincial agency to deal with SWM concerns

__ d) providing training and education programs

__ e) other(s), please specify _____

_____

Of the factors checked on the previous page, choose the three most significant measures the Provincial Government could take to promote SWM practices. Rank them below according to the letter of the alphabet in front of each factor.

RANK 1 (most important) ___
2 ___
3 ___

iii) If NO, should the Provincial Government:

__ a) maintain its existing involvement

__ b) reduce its involvement

8) Education and Training Programs

i) If the Provincial Government provided guidelines on the following aspects of SWM, please check those which would be used by your municipality's staff.

__ a) major-minor drainage design

__ b) erosion and sediment control during construction

__ c) model municipal urban drainage management policies

ii) In which of the following areas is there a need for training of your municipality's staff? Please check as many as applicable.

__ a) preparation of Master Drainage Plans in-house

__ b) review of Master Drainage Plans and Stormwater Management Plans submitted by consultants

__ c) major-minor drainage design

__ d) erosion and sediment control during construction

Please rank these areas according to the letter of the alphabet in front of each factor.

RANK 1 (most important) ___
2 ___
3 ___

iii) How many municipal staff would attend training courses if held in:

a) Toronto

__ 0, __ 1-3, __ 4-5, __ 5 or more

b) a regional location

__ 0, __ 1-3, __ 4-5, __ 5 or more

iv) What fee per employee would your municipality be willing to pay for a training course:

__ a) $0 __ b) up to $50 __ c) up to $100

__ d) up to $200 __ e) more than $200

v) What length would you prefer a training course to be:

__ a) ½ day __ b) 1 day __ c) 2 days

__ d) 3-4 days __ e) more than 4 days

9) Additional Comments

Please include any additional comments in the space provided below. Continue on the back of this page if necessary.

Thank you for your co-operation.

QUESTIONNAIRE B

for

MUNICIPALITIES NOT UTILIZING STORMWATER MANAGEMENT PRACTICES

Name of Respondent _____

Position _____

Municipality _____

1) Problems with Stormwater Drainage

i) In your opinion, is stormwater drainage a problem in your municipality?

__ YES __ NO __ DON'T KNOW

ii) If YES, how severe is the problem?

__ a) very severe __ b) moderately severe

__ c) not severe

iii) If YES, why is it a problem? Please check as many as applicable.

__ a) surface flooding __ b) basement flooding

__ c) pollution __ d) property damage

__ e) damage to watercourses __ e) other(s), please specify

_____

2) Need for Stormwater Management (SWM) Practices

i) In your opinion, is there need for an urban drainage program utilizing stormwater management (SWM) practices in your municipality?

__ YES __ NO __ DON'T KNOW

ii) If YES, should the SWM practices primarily be intended to;

__ a) prevent problems in new developments

__ b) solve problems in existing developments

__ c) address problems downstream

__ d) deal equally with a), b), and c)

__ e) other, please specify _____

iii) If NO, why is there no need? Please check as many as applicable.

__ a) little new development

__ b) present approach to urban drainage working well

__ c) Conservation Authority deals with stormwater management concerns

__ d) SWM practices too expensive

__ e) other(s), please specify _____

_____

3) Obstacles to SWM Practices

i) Have any of the following factors acted as obstacles to the adoption of SWM practices? Please check as many as applicable.

__ a) lack of support from Provincial Ministries

__ b) lack of support from Conservation Authority

__ c) lack of municipal funds

__ d) lack of political commitment at municipal level

__ e) lack of technical expertise among staff

__ f) lack of Provincial policy directive

__ g) lack of Provincial training and education programs

__ h) other(s), please specify _____

_____

Of the factors checked above, choose the three that are the most significant obstacles to the adoption of SWM practices. Rank them below according to the letter of the alphabet in front of each factor.

RANK 1 (most important) ___

2 ___

3 ___

4) Voluntary Adoption of SWM Practices

i) Which of the following factors might convince your municipality to <u>voluntarily</u> adopt SWM practices? Please check as many as applicable.

__ a) increasing environmental problems

__ b) complaints from downstream municipalities or landowners

__ c) flooding complaints by municipal taxpayers

__ d) increased Provincial education and training programs

__ e) other(s), please specify _____

_____

Of the factors checked on the previous page, choose the three that are the most important. Rank them below according to the letter of the alphabet in front of each factor.

RANK 1 (most important) ___
2 ___
3 ___

5) Role of the Province

i) In your opinion, is there a need for the Provincial Government to more actively promote the use of SWM practices?

__YES __ NO __ DON'T KNOW

ii) If YES, which of the following measures should the Provincial Government take? Please check as many as applicable.

__ a) making SWM practices a legal requirement of all new developments

__ b) subsidizing Master Drainage Plans

__ c) assigning one Provincial agency to deal with SWM concerns

__ d) providing training and education programs

__ e) other(s), please specify _____

_____

Of the factors checked above, choose the three most significant measures the Provincial Government could take to promote SWM practices. Rank them below according to the letter of the alphabet in front of each factor.

RANK 1 (most important) ___
2 ___
3 ___

iii) If NO, should the Provincial Government:

__ a) maintain its existing involvement

__ b) reduce its involvement

6) Education and Training Programs

i) If the Provincial Government provided guidelines on the following aspects of stormwater management, please check those which would be used by your municipality's staff.

__ a) major-minor drainage design

__ b) erosion and sediment control during construction

__ c) model municipal urban drainage management policies

ii) In which of the following areas is there a need for training of your municipality's staff? Please check as many as applicable.

__ a) preparation of Master Drainage Plans in-house

__ b) review of Master Drainage Plans and Stormwater Management Plans submitted by consultants

__ c) major-minor drainage design

__ d) erosion and sediment control during construction

Please rank these areas according to their level of importance. Rank them according to the letter of the alphabet in front of each factor.

RANK 1 (most important) ___
2 ___
3 ___
4 ___

iii) How many municipal staff would attend training courses if held in:

a) Toronto

__ 0, __ 1-3, __ 4-5, __ 5 or more

b) a regional location

__ 0, __ 1-3, __ 4-5, __ 5 or more

iv) What fee per employee would your municipality be willing to pay for a training course:

__ a) $0 __ b) up to $50 __ c) up to $100

__ d) up to $200 __ e) more than $200

v) What length would you prefer a training course to be:

__ a) ½ day __ b) 1 day __ c) 2 days

__ d) 3-4 days __ e) more than 4 days

7) Additional Comments

Please include any additional comments in the space provided below. Continue on the back of this page if necessary.

Thank you for your co-operation.

Appendix B

SUMMARY OF SELECTED DATA

Population 10,000 - 25,000

Municipality	Pop. 1982 (000s)	Ave. Ann. Pop. Growth (%)	SWM	Policy
Ancaster	15	1.0	yes	yes
Aurora	16	2.0	yes	yes
Brockville	20	0	yes	no
Cobourg	13	2.6	no	no
Cumberland Twp.	17	7.8	yes	yes
Dundas	20	0.7	yes	yes
East Gwilimbury	13	4.3	yes	no
Elliot Lake	19	19.6	no	no
Flamborough	24	0.6	yes	yes
Georgina Twp.	20	2.5	yes	no
Goulborn Twp.	10	-ve	yes	no
Haldimand	17	0.9	no	no
Huntsville	11	1.4	no	no
Kanata	21	-	yes	yes
Leamington	12	1.3	no	no
Lincoln	14	2.4	yes	no
Lindsay	14	1.1	no	no
Moore Twp.	10	1.6	no	no
Norfolk Twp.	11	0	no	no
Norwich Twp.	10	0	no	no
Orangeville	14	3.9	yes	yes
Orillia	24	0	yes	no

Population 10,000 - 25,000 continued

Municipality	Pop. 1982 (000s)	Ave. Ann. Pop. Growth (%)	SWM	Policy
Owen Sound	20	0.7	no	no
Pelham	11	-ve	yes	no
Sandwich W. Twp.	14	0	no	no
Sarnia Twp.	21	10.7	no	no
Simcoe	14	0	no	no
Trenton	15	0	no	no
Vanier	19	-ve	yes	no
Wallaceburg	11	0	no	no
Whitchurch-Stouff.	14	2.4	yes	no
Wilmot Twp.	11	1.4	yes	no
Woolwich Twp.	16	0	yes	yes
Population 25,000 - 50,000				
Belleville	35	0	no	no
Cornwall	46	0	yes	no
Halton Hills	35	0.9	yes	no
Pickering	39	8.0	yes	yes
Richmond Hill	38	1.7	yes	yes
Stoney Creek	37	3.3	yes	yes
Stratford	26	0.5	no	no
Vaughan	37	16.8	yes	yes
Welland	45	0	no	no
Whitby	38	5.8	yes	yes
Woodstock	26	0	no	no

Municipality	Pop. 1982 (000s)	Ave. Ann. Pop. Growth (%)	SWM	Policy
Population 50,000 - 75,000				
Brantford	73	1.8	no	no
Niagara Falls	71	0.63	no	no
North Bay	51	0.28	no	no
Peterborough	62	0.73	no	no
Waterloo	57	2.7	yes	yes
Population 75,000 - 100,000				
Cambridge	77	1.4	yes	yes
East York	99	-ve	yes	yes
Gloucester	77	6.5	yes	no
Guelph	77	1.9	yes	yes
Markham	82	7.8	yes	yes
Nepean	86	2.3	yes	yes
Oakville	77	1.9	yes	yes
Sault Ste. Marie	83	0.5	no	no
Sudbury	91	-ve	no	no
Population 100,000 - 250,000				
Brampton	155	8.1	yes	yes
Burlington	113	1.5	yes	yes
Kitchener	141	1.2	yes	yes
St. Catharines	124	0.5	yes	no
Thunder Bay	112	0.5	no	no
Windsor	193	-ve	yes	yes

Population 250,000 and greater

Municipality	Pop. 1982 (000s)	Ave. Ann. Pop. Growth (%)	SWM	Policy
Etobicoke	297	0.1	yes	no
Hamilton	308	-ve	yes	no
London	266	1.3	no	no
North York	560	0.1	yes	no
Ottawa	303	0.1	yes	no
Scarborough	436	2.5	yes	yes
Toronto	615	-ve	yes	no

Appendix C

ADDITIONAL COMMENTS

C.1 Municipalities Using SWM

Town of Ancaster, R. Morrow, Co-ordinator Engineer.

"It would appear that Master Drainage Plans for creeks and streams that go through several municipalities should be done by the Conservation Authority. The Hamilton Region Conservation Authority does not do this. However, Grand River and Niagara do. I believe that the province should require Conservation Authorities to prepare the Master Plans as they have jurisdiction over Construction filling etc, in these streams which in many cases go through numerous municipalities. Each municipality independently preparing plans which may not co-ordinate with plans in adjacent upstream or downstream municipalities is not efficient."

Orillia, R. Hawke, Projects Co-ordinator.

"We participate in existing MOE and MTC training programs. 1 day seminar fee of $50 is acceptable although $0 is better. $200 for up to a week course is acceptable. Training is needed to teach new storm techniques, metric, unit hydrograph, and use of computer storm design."

Town of Halton Hills, R. Austin, Town Engineer.

"I fully support the promotion by the province of stormwater management measures at the municipal level."

City of Stoney Creek, J. Amodeo, Development Engineer.

"In smaller and mid-sized municipalities such as Stoney Creek, stormwater management is still relatively new. We are somewhat reluctant to continually put ourselves in the hands of consultants and are establishing policies and measures in-house. We think that the province can fulfill a needed role by providing training courses and funding. Training courses should put an emphasis on the use of micro-computers wherever possible as these are certainly within the financial means of smaller municipalities."

Borough of East York, H. Bratten, Director of Engineering.

"East York is fully developed. As a result of frequent and widespread basement flooding the municipality entered into a programme of stormwater separation following a consultant's study of causes and remedies. This study utilized the SWM Model and was applied to one drainage area. Over the past several years the same consultant was engaged to develop sewer separation plans for each of the drainage areas in the municipality. These plans are being consolidated by staff into a Master 10 year construction programme for storm sewers."

Town of Markham, D. Keliar, Director of Engineering.

"We expect the Major-Minor Guidelines and Erosion and Sedimentation Guidelines will be made available in 1985 by the province. Such steps would provide a base for municipalities in stormwater management measures and it would be advantageous to offer some educational courses for involved managerial staff at some later time."

City of Brampton, D. VanBeilen, Director of Engineering and Development.

"It is our experience that co-ordination of implementation of a SWM plan is the most difficult part. It is just about impossible to get all

developer within a watershed to agree on the approach to be followed and to pay their fair share of the cost involved. Assistance in this area would be appreciated."

City of Burlington, D. Dalgarno, Manager of Design.
"Too many government agencies have some authority in the area of stormwater management approvals and implementation. Where major flood control improvements are required, the provincial funding is very difficult to obtain."

City of St. Catharines, J. Warren, City Engineer.
"My comments apply to a medium sized municipality. Smaller municipalities without permanent professional staff may have great difficulty implementing SWM measures. In my opinion it is useful for the province to issue guidelines and education programmes, however, SWM is so site-specific that there should be no detailed mandatory procedures

City of North York, R. Bond, Director of Engineering.
"Our municipality is almost fully developed and therefore we use the SWM programmes for analyzing the existing systems and upgrading where necessary for re-development."

C.2 Municipalities Not Using SWM

Township of Moore, R. Kerr, Commissioner of Works.
"Our major problems exist in older urban areas where services are sub-standard. Greatest impediment to improvement is lack of funding."

City of Woodstock, P. Bryan-Pulham, Deputy City Engineer.
"During the design of any urban drainage system it is the responsibility of the designer to consider the effects of a surcharged system. Whether or not computer models or more 'traditional' methods of

design are used it is my experience that consideration is given to a major-minor system. I do however, feel that information seminars are valuable in that they alert the designer to state-of-the-art concepts which may assist in the design or prove more cost-effective than the method currently in use. I would not agree with an overall legislated requirement for SWM measures as I consider each area has its unique set of problems, i.e. potentials for flood damage, sensitivity of the receiving watercourse to flow increases, or stormwater pollutant loads."

City of London, I. Anderson, Senior Engineering Technologist.

"London does use SWM techniques in isolated cases where; i) other jurisdictions such as UTRCA and downstream municipalities impose their use, ii) special environmental considerations dictate, and iii) obvious economic benefits are derived."